Masoneilan

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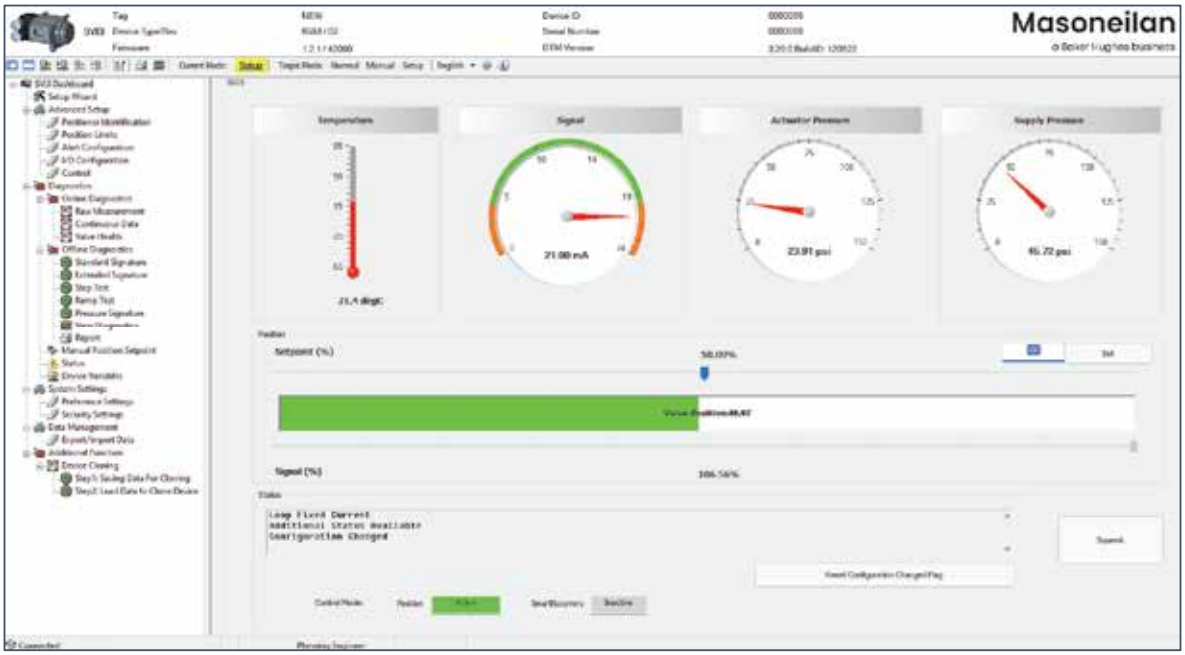
SVI™3 DTM Software

Online Help Manual (Rev. B)



About this Help

This help applies to the following instruments and approved software:

- SVI3 SmartRecovery
- with Firmware version 1.1.1 or higher
- with **ValVue™** version 3.61

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PN 720081815-779-0000 Rev B.

1. Introduction

1.1 SVI3 DTM Introduction

SVI3 Advanced DTM is a user-friendly, graphical interface that allows an efficient setup of an SVI3 mounted on any control valve assembly. Functionality includes:

- Setup Wizard
- Set calibration parameters
- Monitor status/Error Indicators/Audit Trail
- Trend setpoint, valve position, actuator pressure and view the trend as a standalone display
- Perform diagnostic test procedures
- Monitor Valve Health
- User Comments
- User Settings
- Fail Option
- Support SmartRecovery
- Remote display of valve position, actuator pressure(s)
- Set configuration parameters
- Import/Export configuration, diagnostic test result, Valve Health Limits
- Backup and restore configuration (clone device)
- Display comparative test results
- Report
- Data Management Options
- Options Upgrade

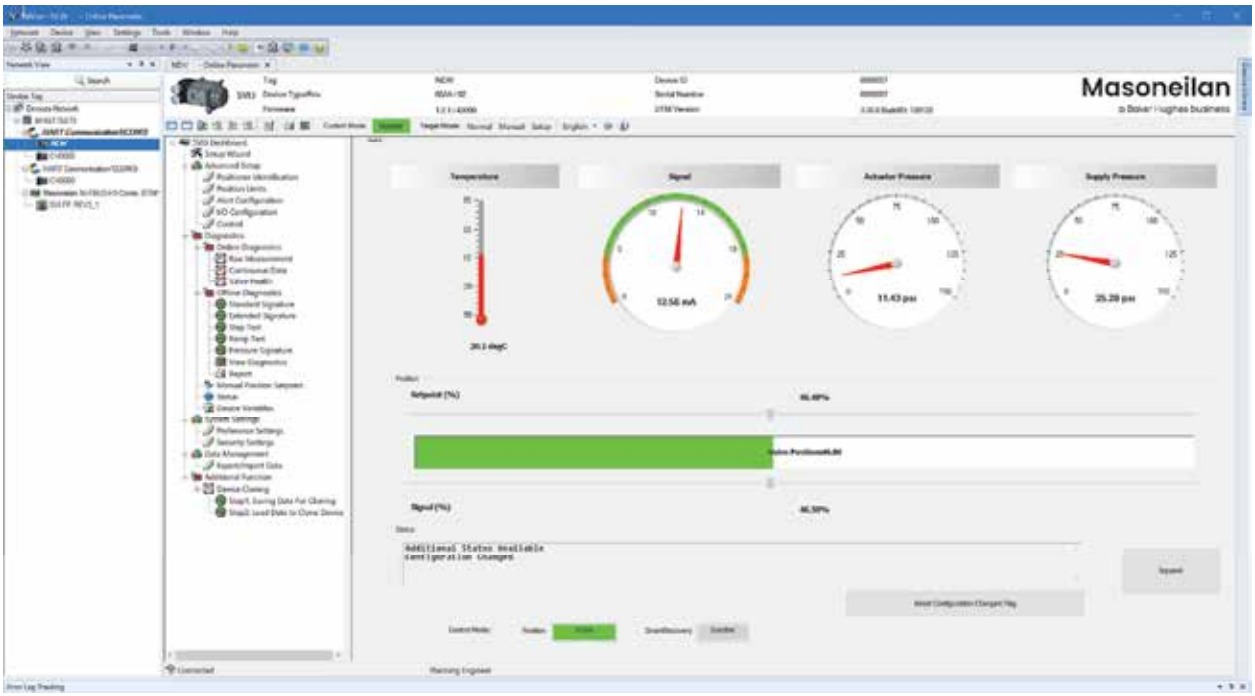


Figure 1 SVI3 Advanced DTM

1.2 SVI3 Advanced DTM Software

SVI3 Advanced DTM provides, through a variety of proprietary host software, the ability to quickly and easily set up the SVI3 you can also monitor operation and diagnose problems with advanced diagnostic capabilities. This help file primarily explains the operation of the SVI3 Advanced DTM using ValVue™ 3. The following programs can host the SVI3 Advanced DTM:

- Masoneilan's ValVue3 (Section 3.3 "Installing ValVue and DTM Software")
- PACTWare® by the PACTWare Consortium®
- AMS Version 13 or above
- PRM software from Yokogawa®
- FDM® by Honeywell
- fdtContainer® by M&M Software®
- For further explanation of each package, refer to its online help.

Note: If you are new to DTM technology there is a good explanation given on the fdtgroup home page. Visit: https://fdtgroup.org/technology/components/ for an explanation of basic frame and DTM concepts.

1.2.1 Advanced and Online Diagnostics

The SVI3 offers various levels of control valve diagnostics. Up to five pressure sensors and sensors that detect circuit board temperature, loop current, and reference voltage, are available for diagnostics. For the most recent software visit and for licensing information visit our SVI3 web site at: https://valves.bakerhughes.com/resource-center.

Table 1 SVI3 DTM Standard versus Advanced Edition

DTM Features		Standard Edition	Advanced Edition
Offline Configuration		x	x
Setup Wizard		x	x
Trending			x
Upload Parameters		x	x
Download Parameters		x	x
Advanced Setup	Positioner Identification	x	x
	Position Limits	x	x
	Alert Configuration	x	x
	I/O Configuration	x	x
	Control	x	x
Online Diagnostics	Raw Measurement	x	x
	Continuous Data	x	x
	Valve Health		x[2]
	Manual Position Setpoint	x	x
	Fault Status	x	x
	Device Variable		x

Table 1 (Continued) SVI3 DTM Standard versus Advanced Edition

DTM Features		Standard Edition	Advanced Edition
Offline Diagnostics	Standard Signature	x[1]	x[1]
	Extended Signature		x[1]
	Step test		x
	Ramp Test		x
	SmartRecovery Ramp Test		x[1]
	View Diagnostics		x
Preference Setting	File Path Configuration	x	x
	Security View	x	x
Additional features	Digital Upgrade	x	x
	Report	x	x
	Device Cloning		x
	Data management	x	x
	Adding Comments		x

Notes:

1. Available for Advanced and Online Valve Diagnostics version of positioner only
2. Available for Online Valve Diagnostics version of positioner only

Security View – Available for administrator user only

1.3 About This Help File

These instructions are intended to help a field engineer install, setup, and calibrate an SVI3 in the most efficient manner possible. If you experience problems that are not documented, contact Baker Hughes or your local representative.

1.3.1 Conventions Used in This Help File

Conventions used in this help file are as follows:

- *Italicized* letters are used when referencing a term used in the SVI3 display window, for emphasis on important items and for fields where data appears or for user-entered data.
- Actions performed on buttons, checkboxes, etc. appear **bolded**.

Note: Indicates important facts and conditions.

Indicates a potentially hazardous situation, which if not avoided could result in property damage or data loss.

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

1.4 Baker Hughes Documentation Resources for Masoneilan Products

Baker Hughes publishes several different resources for documentation on **Masoneilan™** products:

- Hardware quick starts contain installation information and other basic information related to getting a device installed and very generally configured.
- Hardware instruction manuals contain more complete information for configuration of a device. This manual also includes information on background functionality and special circumstances useful in installation, configuration and operation/ troubleshooting.
- Software manuals contain more complete information for the software configuration of a device. This manual also includes information on background functionality and special circumstances useful in configuration and operation (including diagnostics and their interpretation). These manual represent the same source material as the online help.
- Handheld documents: Give the DD mappings for the product.
- Please check the website: https://valves.bakerhughes.com/resource-center to get documentation resources.

1.4.1 Related Documentation for the SVI3 DTM

- ValVue documentation: The SVI3 DTM works inside FDT frames (such as PACTware), however it is designed to work best with our ValVue3 software. See Masoneilan Products ValVue3 Software Manual.
- Masoneilan SVI3 Digital Positioner Advanced Performance Quick Start Guide.
- Masoneilan SVI3 Digital Positioner Advanced Performance Installation and Maintenance Manual.

2. Registration Process

2.1 Licensing

This section is meant to be a generic discussion of the licensing process for ValVue and Masoneilan software DTMs. License Dialogs that appear differ based on the Masoneilan software in use.

See Section 2.2 “Registration During the Trial Period” for further details.

- For ValVue3 or DTM registration you must have Administrator rights to install the frame application (i.e. ValVue3, PACTware etc).
- This also applies when using Masoneilan DTMs inside of PACTware® or other vendor and updating licensing.
- If you are performing these functions on a Masoneilan DTM using ValVue3 and ValVue3 is run as an Administrator, then the DTMs inherit the Windows Administrator properties from ValVue3.
- DTM is auto inherited as advanced edition when ValVue3 is registered with advanced edition.

2.2 Registration During the Trial Period

The license trial period works as follows:

1. Once you download and install the DTM, you are granted a 30 days trial period. We strongly encourages you to register your license with us as soon as possible. During the 30 days, you have access to all the advanced features of DTM.
2. Once the first 30 days expires, you lose the advanced features. You then have an additional 30 days period, after which you must register to continue using the product. Contact Baker Hughes at svisupport@bakerhughes.com.
3. The first time you open DTM, if the product is on trial, a dialog appears.

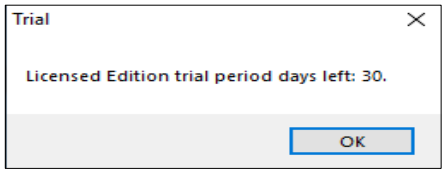


Figure 2 Trial Registration Dialog: Newly Installed

After 30 days without purchase or registration, the first time you open the DTM, Figure 3 appears.

Figure 3 Advanced Features Expired

If you open the DTM after the trial period expires, Figure 4 appears.

Figure 4 Trial Expired

2.3 Registration Process

1. Open a Masoneilan DTM, select a device and then select **Additional Functions > DTM Licensing** (Figure 5).

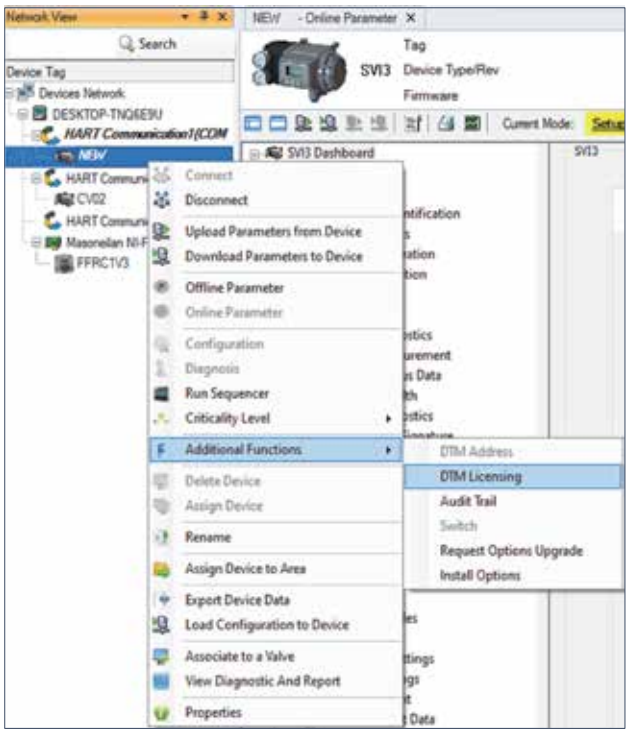


Figure 5 Sample DTM Registration Path

2. Use the registration dialog (Figure 6) to:
   - Section 2.3.1 “Register the Product” - Required before use or at the end of the 30 days trial period.
   - Section 2.3.2 “Activate License” - Required before use or at the end of the 30 days trial period.

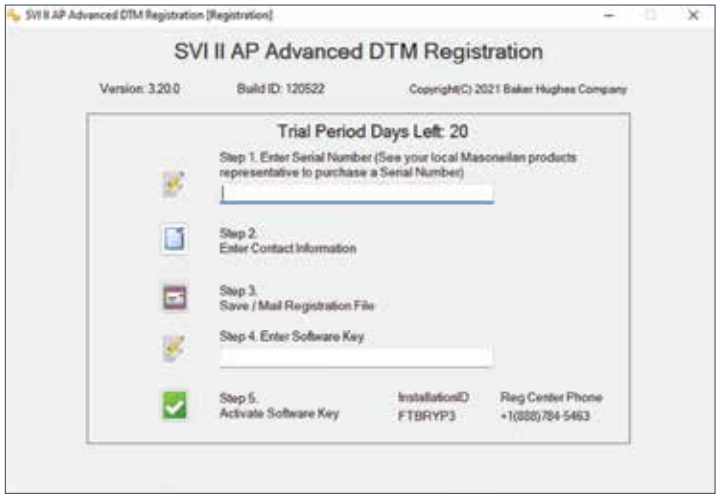


Figure 6 DTM Registration

The Masoneilan *DTM Serial Number* is obtained by contacting one of our channel partners or by contacting Baker Hughes directly (svisupport@bakerhughes.com). Upon download (*https://valves.bakerhughes.com/resource-center*), install and first use, your trial period starts. To buy/register, contact a channel partner or contact svisupport@bakerhughes.com.

2.3.1 Register the Product

To register the product:

1. Enter the serial number in *Step 1* of Figure 6. The *Serial Number* auto-fills for the *Standard Edition*.
2. Click  (associated with *Step 2* of Figure 6) and Figure 7 appears.

Figure 7 Contact Information

Note: Use the copy pulldown, as seen above, to import information that has been previously entered for another Masoneilan software.

3. Enter all required information, as marked by *, click Save then Figure 6 appears click  and Figure 8 appears, if email access is detected.
   If you do not have email access or want to send from another location, click **No** and see “Register the Product From Another Laptop” in Section 2.3.1 “Register the Product”.

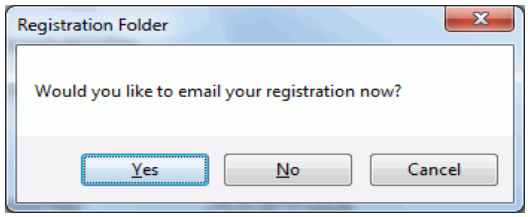


Figure 8 Email Registration

4. Click **Yes** and the registration email appears using your default email setup. The email has an *.xml* attachment containing licensing information.
5. Send the email. A return email is sent containing the software key. Proceed to Section 2.3.2 “Activate License”.

2.3.1.1 Register the Product From Another Laptop

If you do not have email access, Figure 9 appears (or want to send from another location and clicked **No). Use** Figure 9 to save the .xml file to a location for use.

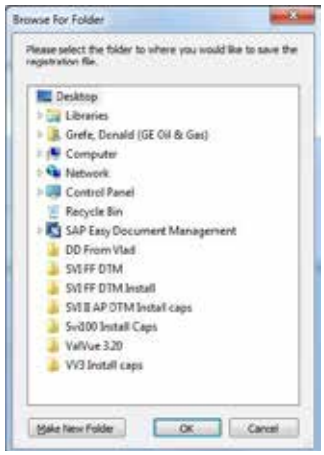


Figure 9 Browse for Folder

1. Browse to the desired folder (or make a folder), click **OK** and Figure 10 appears.

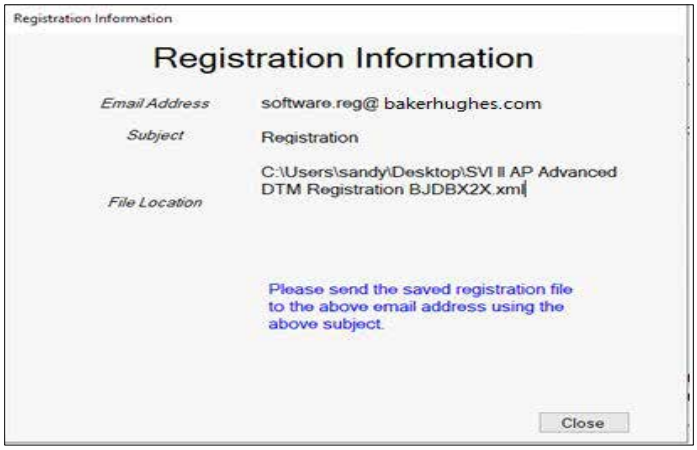


Figure 10 Registration File and Information

This dialog contains the information for the email address to send the file, the email Subject line and the File Location. These three items can be copied and pasted into a text file for ease of use.

2. Click Close and copy the .xml file to a laptop with an email server. In this case, if you have multiple .xml file from multiple upgrades, you can attach them to one email.
3. Send the email. A return email is sent containing the activation code. Proceed to Section 2.3.2 “Activate License”.

2.3.2 Activate License

To activate the license:

1. Enter the emailed or channel partner acquired software key (Figure 6 under Section 2.3 “Registration Process”).
2. Click  and Figure 11 appears.

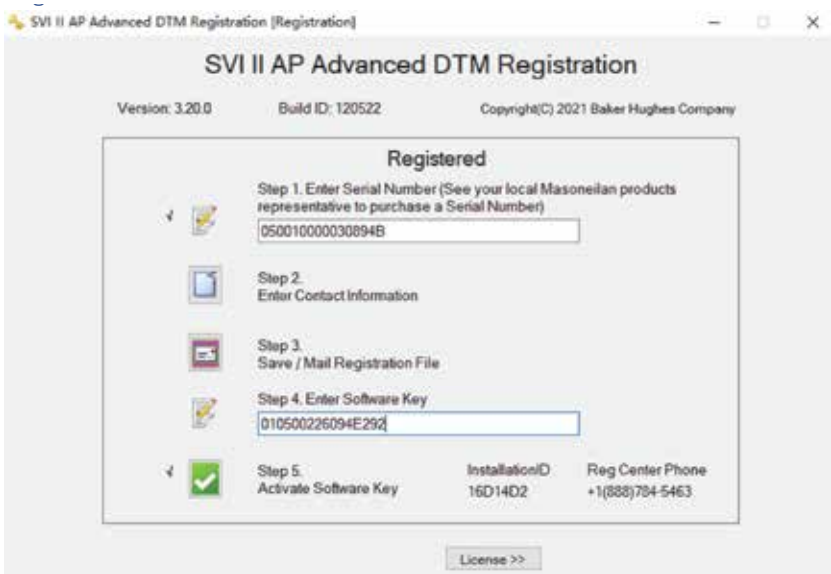


Figure 11 DTM Registration-Registered

3. Click License >> and Figure 12 appears.

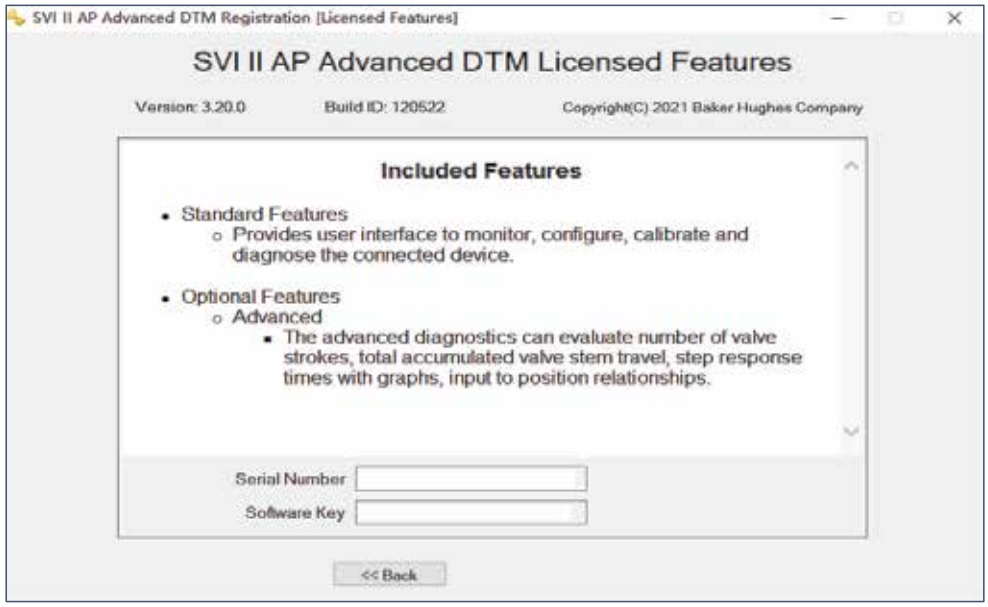


Figure 12 Included Features

3. ValVue3 and DTM Installation and Logon

3.1 Hardware and Operating System Requirements

To successfully install and run ValVue software, your computer system must meet or exceed the following minimum hardware and software requirements.

- Windows Server® 2008 R2 SP1, Windows Server® 2008 SP2, Windows Server® 2012, Windows Server® 2016, Windows® 7 sp1, Windows® 8.0, Windows® 10 or Windows® 11
- 10 G of free hard disk space
- 4 G of RAM
- Microsoft .NET Framework 2.0 SP2, Microsoft .NET Framework 4.0 FULL, and Microsoft .NET Framework 3.5 SP1

3.2 HART Related Issues

Before installing the DTM, determine which port the computer uses for serial (RS-232 or USB) communication. The HART™ modem uses this port for communication with the SVI3 positioner.

3.2.1 HART Compliance

The SVI3 Advanced DTM requires a HART compliant communications loop. The HART protocol specifies the noise level, impedance requirements, and configuration of the loop. Conventional communications loops consisting of the following components meet requirements for HART compliance.

- Quality current source having low noise and high impedance
- Minimum loop impedance of 250 Ohms
- Twisted pair cable suitable for 4 - 20 mA current loops

When a safe barrier separates the communicating devices, a HART compliant barrier must be used.

Note: You cannot connect or use the DTM and another HART master terminal device (at the same time), for example a handheld device.

CAUTION

Some Distributed Control System output circuits are incompatible with the HART protocol. Connecting a HART modem to such a circuit can cause a process upset. Use a HART filter. Consult the DCS manufacturer to verity that the DCS is compatible with HART , before connecting a HART modem and using the DTM.

3.2.2 Failure to Communicate

If the PC (using a modem) fails to communicate with the HART or SVI3 Advanced DTM the PC displays then either the message *No Devices Found* in the DTM main screen, or a COM port communication error occurs, or the message *HART I/O Failed* appears if the device communications fails during the session. Communication failure prevents the PC from establishing a link. Possible causes of communications failure related to installation include:

- Insufficient loop current and voltage
- Poor wiring contacts
- Improper connection of the HART modem to the computer or a busy port (wait for COM port to clear or use another port)
- Incorrect serial port
- Using the DTM with another HART master terminal in service
- Insufficient loop impedance (a minimum of 250 Ohms is required)
- Field device has a non-zero polling address (Set to multidrop)

If HART compliance problems are suspect prepare a detailed description of the loop, including all devices on the loop, type of wiring used, loop length, and presence of any possible interference sources before contacting the factory for assistance.

3.3 Installing ValVue and DTM Software

ValVue3 installer installs not only the ValVue and DTM software but the SQL Express® software, the Masoneilan NI-FBUS-H1 Comm. DTM, Microsoft® VC++ Redistributable package, CodeWright HART Comm. DTM and the .Net framework.

Operation of the SVI3 Advanced DTM requires installation of the following software components:

- ValVue3 software or one of the items listed under below to access the SVI3 Advanced DTM:
- PACTWare software, which includes generic HART DTM software and HART communications software
- AMS Version 13 or above
- PRM software from Yokogawa
- Field Device Manager (FDM) from Honeywell
- fdtContainerfrom M&M Software GmbH

Note: During the install, SQL is installed. It is highly recommended that you check for ValVue updates on the Baker Hughes website (https://valves.bakerhughes.com/resource-center) every six months to keep this program current for security issues.

To install the software:

1. Double-click **ValVue3.xFullEditionInstaller.exe** and Figure 13 appears.

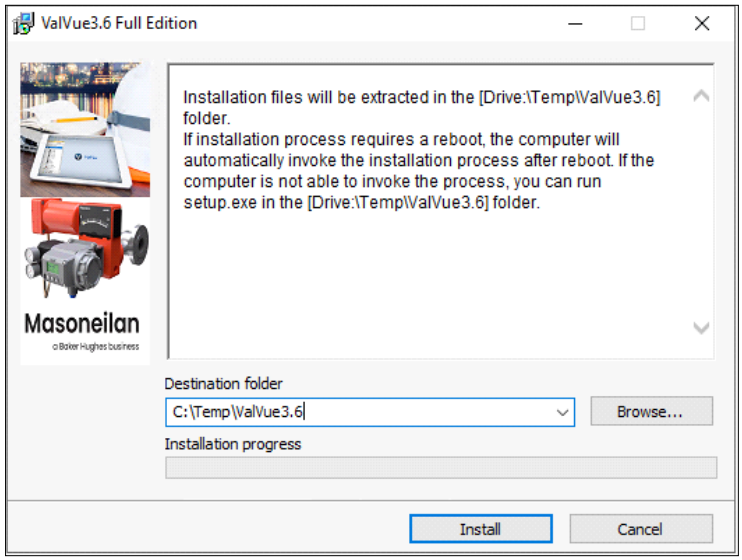


Figure 13 Install Unzip

2. Click **Install** and the extraction process begins. Click to allow installation on any intermediate messages that appear to complete the installation.

Note: During the initial installation, if you do not have SQL installed, you are prompted to reboot your system. Follow the prompts to do so and the ValVue install automatically commences after reboot.

3.4 Log On

1. Select **Start > All Programs > Masoneilan > ValVue3 > ValVue** and Figure 14 appears.

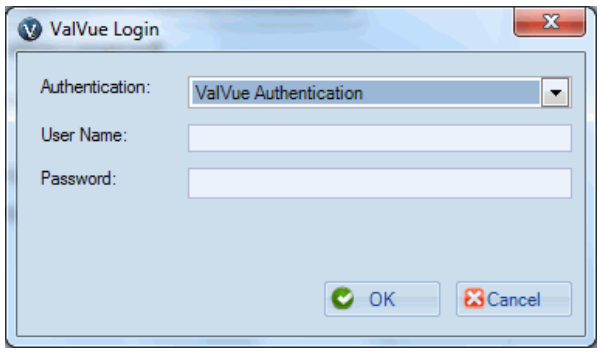


Figure 14 ValVue Login

2. Sign on to ValVue3 with default values:
   - User name admin.
   - Password ValVue3.

Note: For security purposes, you are forced to change your password during the first use. The ValVue and SVI3 DTM license trial period works as follows:

1. Once you download and install the ValVue software, you are granted a 30 days trial period. During the 30 days, you have access to all the advanced features of ValVue and the SVI3 DTM.

2 Once the first 30 days expires, you lose the advanced features of both ValVue and the SVI3 DTM. You then have an additional 30 days period with just standard features, after which you must register to continue using the product. We strongly encourage you to register your license with us as soon as possible. Contact Baker Hughes at software.reg@bakerhughes.com.

The evaluation periods for both are independent of each other and commence with first use.

Note: If you have installed/deleted DTMs or updated ValVue, a dialog appears when you open ValVue3: Click:

• Yes and the library is updated.

• No and you need to manually updated from the DTM Library Management dialog to access any new functionality.

3. Use the *Authentication* pulldown to select either:
   - Windows Authentication: Any user in the list of the ValVue user group can logon. This user group is created by the system administrator.
   - ValVue Authentication: This is the default username and password for first login. Username Admin and Password: ValVue3. These must be changed after the first login.

During your initial login Figure 15 appears.

Figure 15 Change Password

You must change your password according to the constraints shown in Figure 16.

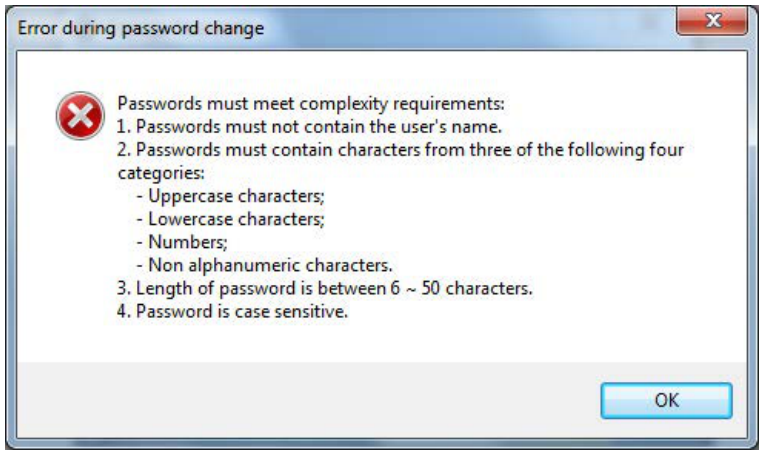


Figure 16 Passwords Constraints

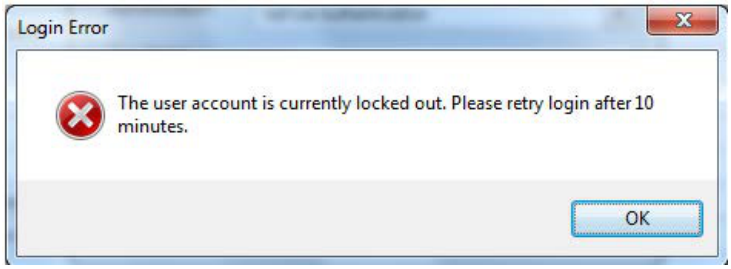
- *Login as Current Windows User*: Your *Domain\Username* appear in *User Name*.
- Windows Authentication: Enter a Username, Password and use the Domain pulldown to select the domain.
- *ValVue Authentication*: Enter a *User Name* and *Password*.
- Login as Current Windows User

4. Click **OK** and the main screen appears.

Note: After you successfully login into ValVue3, the User Authentication Mode is saved and next time you login, the last authentication mode automatically appears.

Note: User Account Security Lockout

A user account is locked out after five unsuccessful password entries and the following dialog appears:



If this occurs, wait ten minutes and retry. This behavior occurs cyclically until a successful login is completed.

The lockout behavior is account specific and occurs when using either Login as Windows Authentication or ValVue Authentication.

4. Opening SVI3 Advanced DTM Software

4.1 Opening and communicating Hart Modem

1. Click **Settings > Field Networks**, click **Add** and Figure 17 appears.
   Select **HART Modem** and click **OK**.

Figure 17 Add Field Network

2. Click **OK** again to add the *HART Modem* to *Network View* and Figure 18 appears.

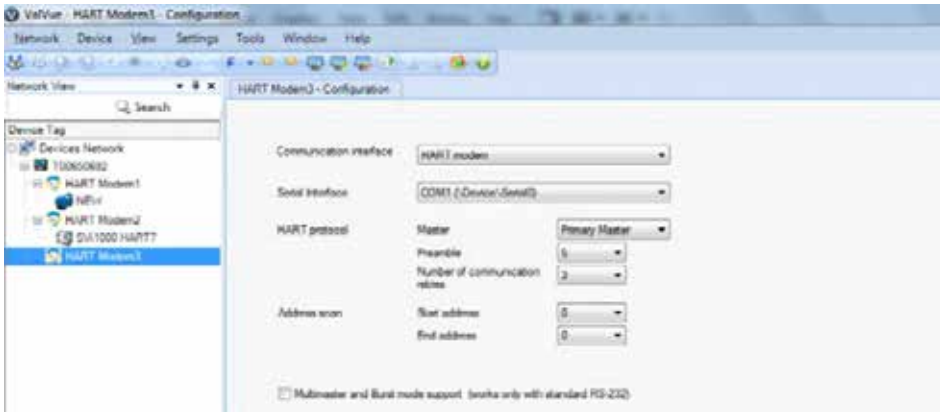


Figure 18 HART Modem Configuration Tab

3. Ensure the *Serial Interface* pulldown and the *Address scan* fields are correct. Click **Apply** and then **OK**.

Note: If device is connected (or powered through DCS), set Master to Secondary Master.

4.2 Opening and connecting to the SVI3 DTM

1. Right-click on the **HART Modem** and do one of the following:

   • Selecting **Network > Rebuild Network**. Right-click on the SVI3 in the *Project* pane and click **Connect**

   or

   • Selecting **Open Connected Device** and if physically connected correctly it opens.

   or

   • Clicking **Add New Device,** Figure 19 appears, highlighting **SVI3** and clicking **OK**. Right-click on the SVI3 in the *Project* pane and click **Connect.**

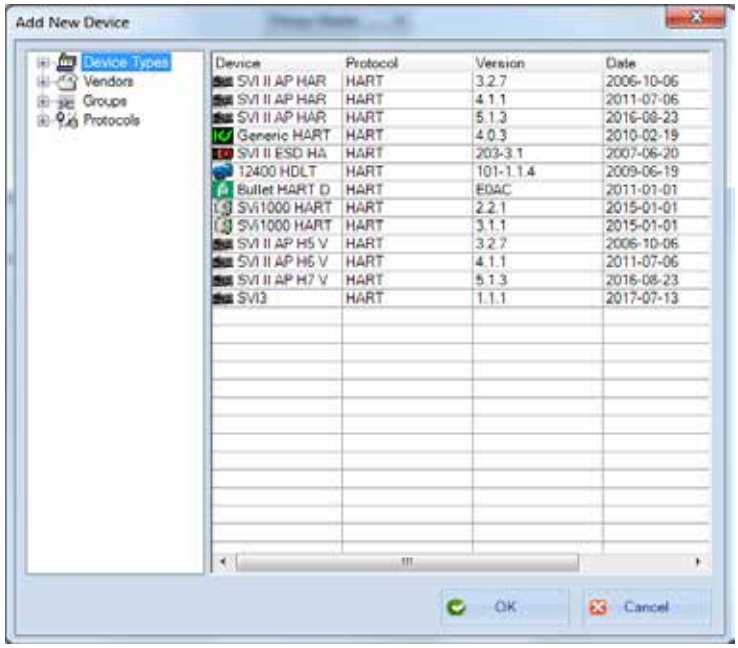


Figure 19 Add New Device

2. Click **OK** to the DTM evaluation period warning. If it appears, refer Section 2.1 “Licensing” prior to expiration to register and gain advance functionality. The SVI3 DTM opens. If the SVI3 DTM doesn’t open automatically: Select the SVI3 device you added, right-click and select **Online Parameter**.

3. Check that the SVI3 is connected (Figure 20).

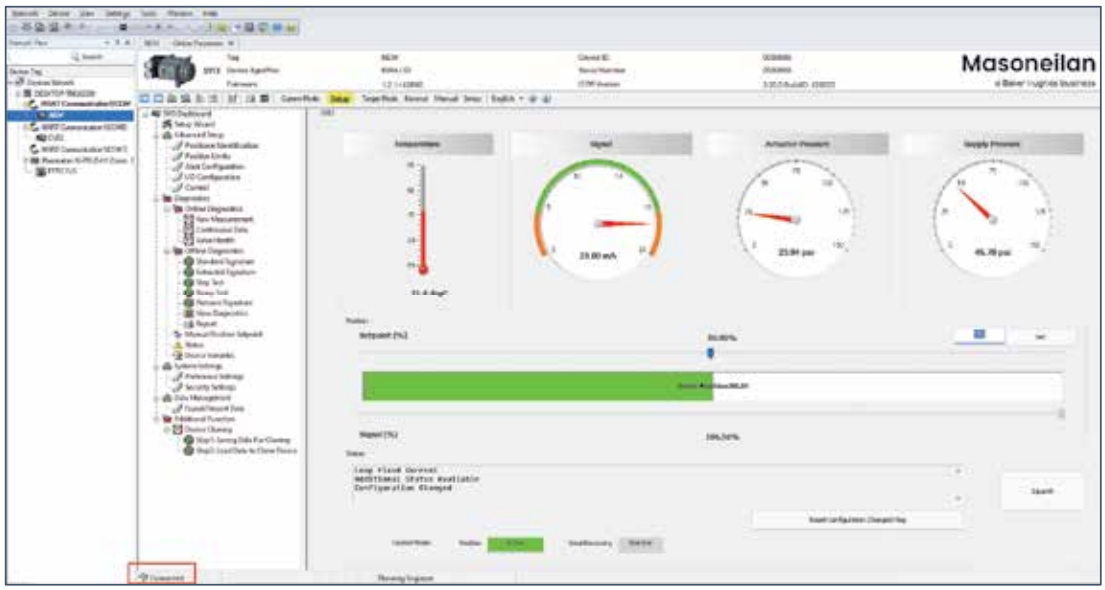


Figure 20 Connected

If not it does not connect:

- Right-click on the device in the topology pane, select **Additional Functions** > **DTM Address** and Figure 21 appears. Correct the *Polling Address* and click **Apply**. Disconnect and then reconnect.

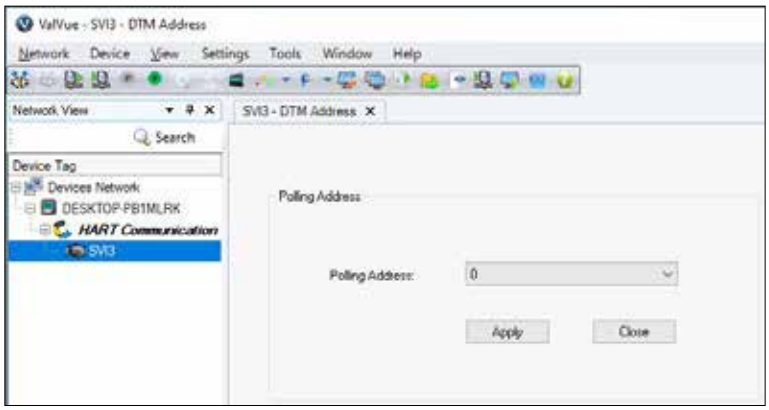


Figure 21 Communication Tab

4. Click **Upload All Parameters** icon (see red box in Figure 20).

Note: Upload means to pull data from the SVI3 and load data into DTM onto the PC. Download puts data from the DTM into the SVI3.

5. SVI3 DTM Work Environment

5.1 Overview

This section describes the SVI3 Advanced DTM main screen (*SVI3 Dashboard* screen) and how to accomplish general SVI3 Advanced DTM tasks. After you have successfully launched and logged into the SVI3 Advanced DTM Figure 22 appears.

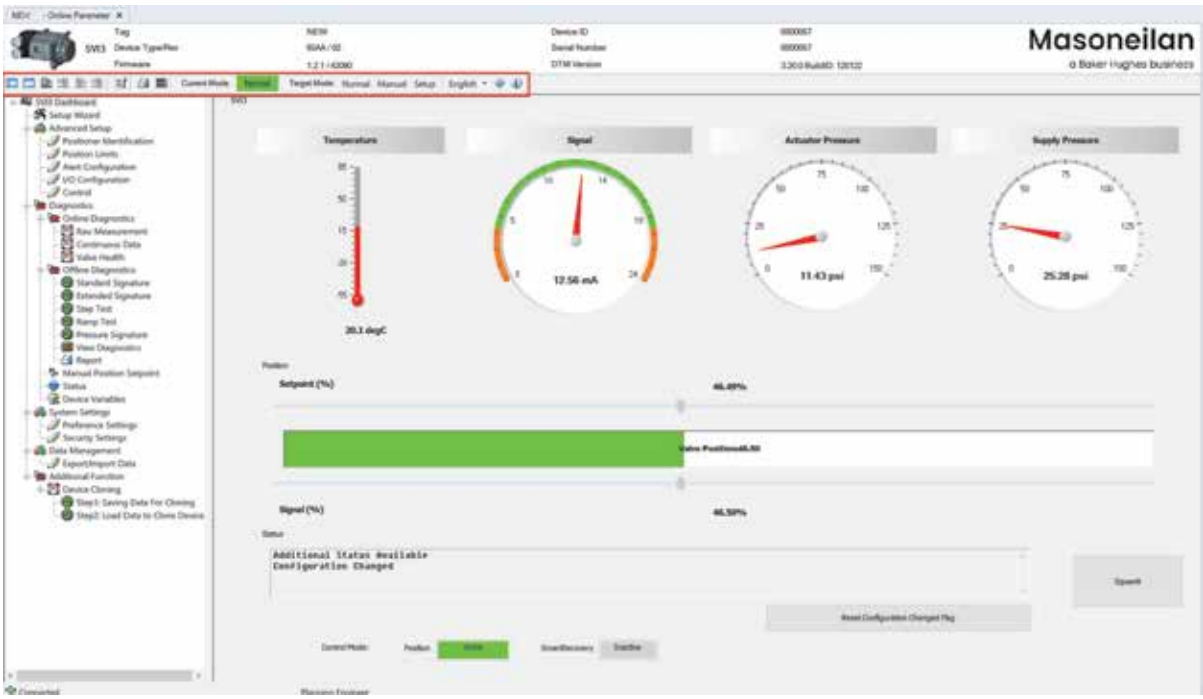


Figure 22 SVI3 Advanced DTM Main Screen

Note: This discussion is restricted to the SVI3 Advanced DTM operations only.

5.2 SVI3 DTM Specific Icon Bar Items

There are several items on the icon bar that are specific to the SVI3 DTM (Table 2).

Table 2 SVI3 DTM Specific Icon Bar Items

Icon	Description
	Toggles the DTM directory on/off.
	Toggles the area at the top of the screen with the *Tag*, *Device ID*, etc. on/off.
	Uploads all the data from the device.
	Downloads all the data from the SVI3 DTM to the device.
	Uploads only the data from the active tab from the device.
	Downloads only the data from the active tab to the device.

Table 2 SVI3 DTM Specific Icon Bar Items (Continued)

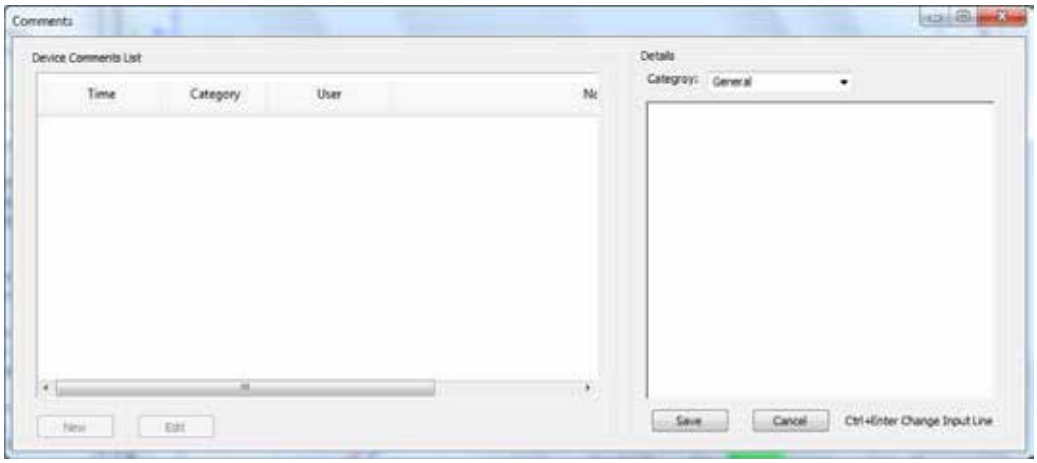
Icon	Description
	Opens a dialog to add a notes to the DTM data (Figure 23).  **Figure 23 SVI3 Comments Dialog** The first time this dialog is used you can add comments without clicking *Add New*. All comments are timestamped, assigned the *User ID* of the person who is signed into the program and once *Save* is clicked added to the *Notes* field. • Click **Add New** to enter new comments. You then can add new notes. • Use the *Category* pulldown to select an area of relevance for the note: **Configuration**, **Diagnostics**, **General** or **Repair**. Once saved, this *Category cannot* be edited. • Click **Save** to save comments. The comment is tied to the positioner and is preserved even when a newer version of the software is installed. • Click **Edit** to make changes to existing notes. To edit an existing note: 1. Select the note. 2. Click **Edit** and the text *only* is opened for edit. Click **Ctrl+Enter** to move to the next line. 3. Click **Save**.
	Click to generate a pdf report of the SVI3 DTM and its settings. See Section 14.1 “Report”.
	Click to open the *Trend* feature. See Section 5.7 “Standalone Trend”.

Table 2 SVI3 DTM Specific Icon Bar Items (Continued)

Icon	Description
English	Click the down arrow to choose a language. This changes the display language for the SVI3 DTM. It does not change the language in use for the communication DTM. Languages supported include: • *English* • *Chinese - simplified* • *Japanese* • *Russian* • *Spanish* • *French* • *Italian* • *German*
	Click to open the Help pdf.
	Click to open the *About SVI3 DTM* dialog (Figure 24).  **Figure 23 SVI3 Comments Dialog**

5.3 Actual Mode and Target Mode

Use this area located at the top of all *SVI3 Advanced DTM* screens (Figure 22 - ①) to view the current status of the SVI3 and to change the operating mode.

5.3.1 Actual Mode

The *Actual Mode* displays either the actual mode of the SVI3 or its status as in Table 3.

Table 3 Actual Mode Indicators

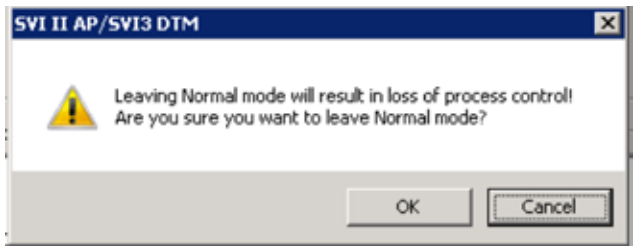
Icon	Description
Normal	Indicates normal operation where the SVI3 follows the 4 - 20 mA input signal and positions the valve accordingly. Whenever you leave the *Normal* mode, a warning appears (Figure 25).  **Figure 25 Leaving Normal Mode Warning** *Click OK to continue the mode change.*
Manual	Indicates that the SVI3 is in *Manual* mode. The valve setpoint is set by the valve software, the local pushbutton or a HART compatible system. When changing to this mode the setpoint becomes the actual position. In this mode the valve does not respond to the input signal. Instead it remains stable in one position, which is the position that the valve was in when manual mode was entered or a new position selected by you (by chang-ing the setpoint on the Section 6 “SVI3 Dashboard” or on the Section 9.12 “Diagnostics: Manual Position Setpoint”). **⚠WARNING** *The positioner should not be left in this mode after required tasks are complete as it cannot automatically respond to wprocess changes.*

Table 3 Actual Mode Indicators (Continued)

Icon	Description
Setup	Indicates that the SVI3 is in *Setup* mode. You can set calibration and configuration parameters. Additionally, you can run response time tests, a standard actuator signature test and an extended actuator signature test (if capability is purchased). **WARNING** *The positioner should not be left in this mode after required tasks are complete as it cannot automatically respond to process changes.*
FailSafe	Indicates that the SVI3 is in *Failsafe* mode. When the SVI3 cannot operate correctly the device goes to the failsafe position and remains in the failsafe mode until the issue which caused the device to go into failsafe condition is fixed.
Low Power	Indicates that the SVI3 has low power. Device is not functional. LOW_POWER: Input current < 3.15 mA. A 0.10mA dead-band is required to remove this indicator.
Disconnected	Indicates that the SVI3 is disconnected. Select the positioner in the topology pane, right-click and select **Connect** or click the icon ( ) in the ValVue icon bar.

5.3.2 Target Mode

Use this feature to quickly move between modes (Figure 26).

Figure 26 Target Mode

To change modes:

• Click the mode. When leaving *Normal* mode a dialog appears (Figure 27).

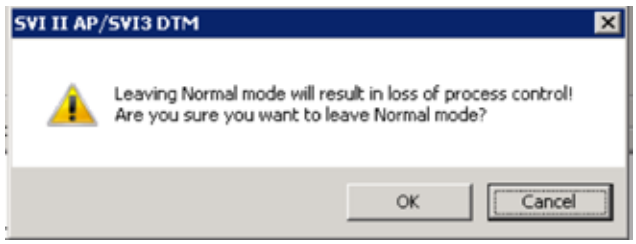


Figure 27 Leaving Normal Mode

5.4 Tab Navigation

On tabs that exist as part of groups, such as *Advanced Setup*, three buttons appear:

Click to navigate back to the previous tab in the group. Inactive when on the first page in the group.

Click to download the changes made on the tab to the device. Inactive when disconnected and if no changes have been made.

Click to navigate back to the next tab in the group. Inactive when on the last page in the group.

5.5 SVI3 Advanced DTM Directory Tree

Use this (Figure 28) to navigate the various screens for the following functional areas.

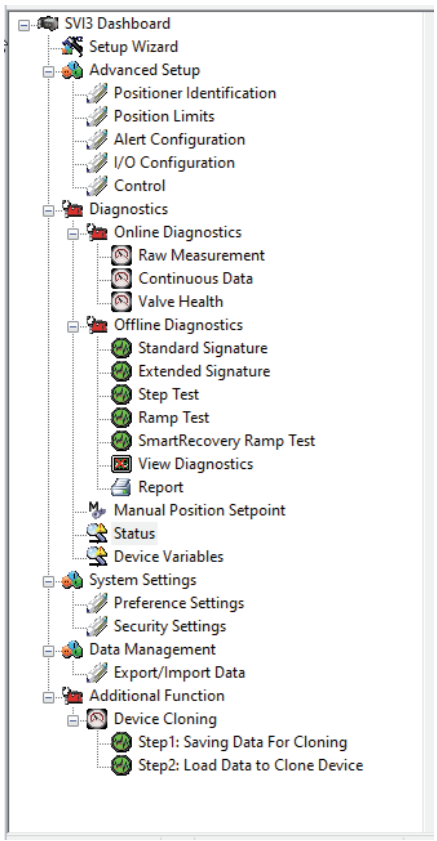


Figure 28 SVI3 Advanced DTM Directory Tree

- *SVI Dashboard* - Screen that displays operational signal readings. See Section 6 “SVI3 Dashboard”.
- *Setup Wizard* - Screen to perform automatic positioner/valve setup for stops and to perform autotuning. See Section 7 “Setup Wizard”.
- *Advanced Setup* - A series of screens and sub tabs for manual configuring a wide range of advanced settings. See Section 8 “Advanced Setup”.
- *Diagnostics* - A series of screens and sub-tabs for fault analysis and for viewing data numerically and graphically to analyze positioner/valve performance. This area is broken into two groups: *Online* and *Offline Diagnostics*. See Section 9 “Diagnostics”. Additionally, you can generate a configuration report (see Figure 126).

- *System Settings* - Screens for manual configuring paths for the reports and data files associated with the particular positioner. See Section 10.1 “Preference Settings”. and a screen for configuring access to various system functions. See Section “Function Settings for DTM”.
- *Data Management* - Screens for data export/import and generating a positioner configuration report. See Section 11.1 “Data Management: Export/Import Data”. and Section 14 “Report”, respectively.
- *Additional Function* - For only cloning positioner.

5.6 Topology Right-Click Menu

Use the topology view right-click menu to access functions some of which are ValVue3 related and some SVI3 DTM related. Figure 29 shows which items are related to positioner DTM operations and which to ValVue3 (Black boxes are SVI3 DTM operations and red are ValVue3). Descriptions for all of these can be found in the ValVue3 help and the help print manual.

Note: The items available from Valvue3 may not be available if you use PACTware or other DTM and run a Masoneilan specific positioner DTM inside of it.

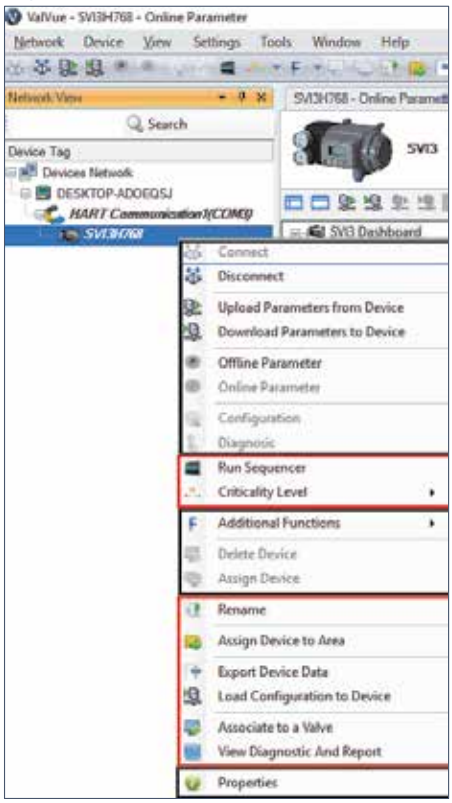


Figure 29 Topology Right-Click Menu

5.6.1 PACTware Topology Menu

The PACTware menu is discussed here as an example of features that are available if you operate the SVI3 DTM inside of Masoneilan's ValVue3, but are absent if you use another vendor's overall DTM. Figure 30 shows the topology pane right-click menu for ValVue3 and PACTware side-by-side.

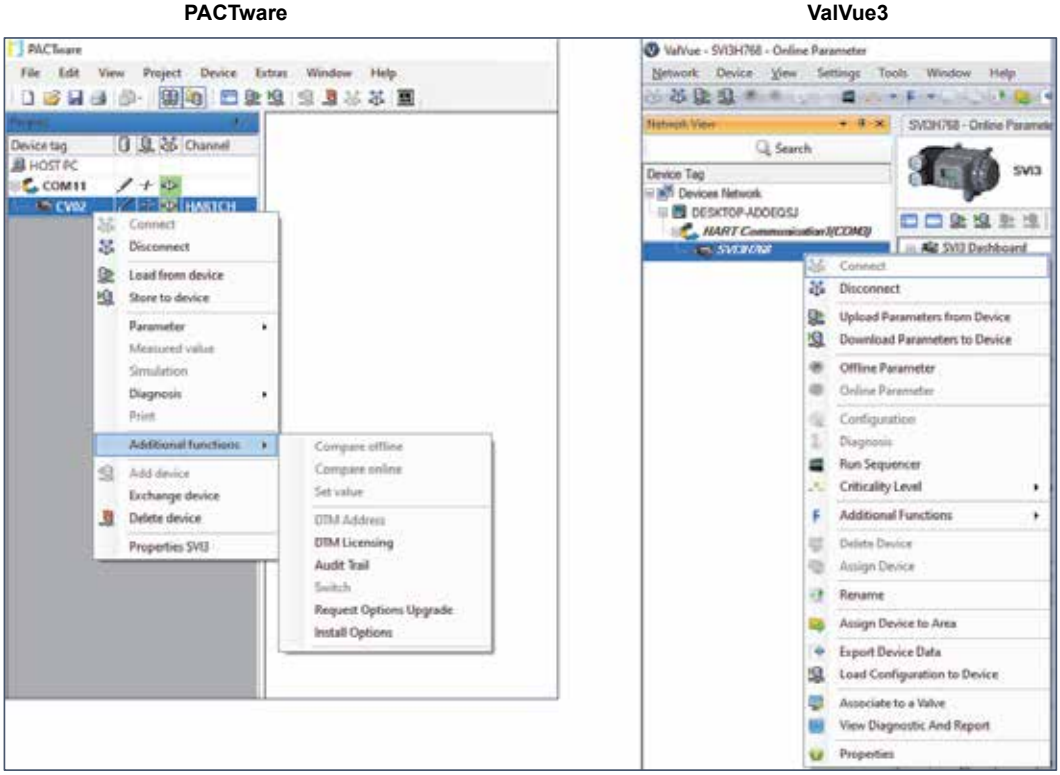


Figure 30 Topology Pane Comparison

Features offered by ValVue3 include:

- Criticality Level
- Run Sequencer
- Associate to Valve - without this you cannot link a positioner and a valve together for analysis.
- Assign Device to Area - without this you cannot assign a device to an area or view.
- Export Device Data- export device data for later use.
- View Diagnostic and Report - Opens the Signature History dialog to select a test result or results to view. Test results can also be imported or exported to an Unified Signature format (.usf).

5.7 Standalone Trend

Use the standalone *Trend* (Figure 31) to observe the valve real time performance. The process trend graph is useful for troubleshooting a control valve and for tuning the PID positioning parameters. The process trend graph can be detached as a separate window for viewing while performing calibration and diagnostic tasks.

See Section 9.6 “Diagnostics: Offline Diagnostics” for a further description of functionalities.

To open the trend:

• Click the *Trend* icon 

In manual or setup mode, user can enter setpoint to change the valve position.

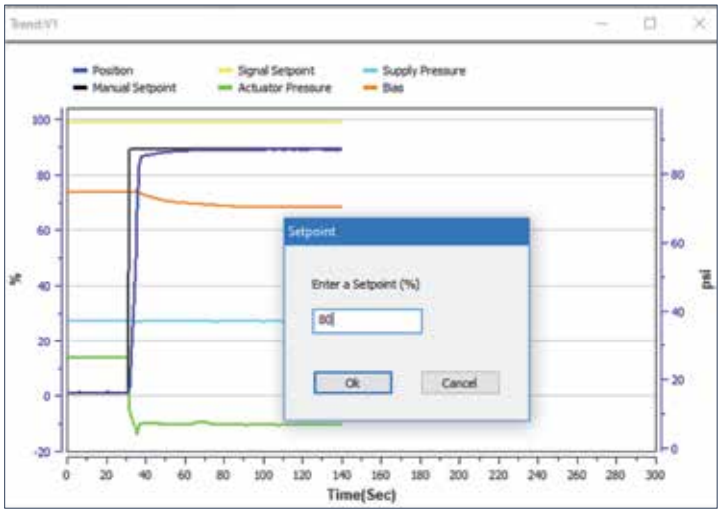


Figure 31 Standalone Trend

All graphs have some common functionality, including:

- Click-and-hold on any axis’ legend to drag along the axis.
- Press the CTRL button and mouse drag to zoom/unzoom on the graph.
- Axis right-click menu: There is a menu available by right-clicking any axis that has three selections:
- Tracking Enabled: Enables/disables tracking.
- Update Resume Values: Store the axis scale for the Tracking Enabled.
- The next time Tracking Enabled is engaged, the tracking restores the axis to the stored scale instead the initial scale.
- Zoom to Fit: Activates a function that sizes the graph to fit the selected display area.

- Plot right-click menu: Click in the body of the graph and the following items appear:
  - Save: Save the Trend as a .tre file for later use.
  - Load: Opens a dialog to load a .tre file that was previously saved. This clears all data presently in memory.
  - Stop: Stops data presentation the trend. This menu item then changes to Resume to resume presentation.
  - Refresh: Clears the display and starts sampling new data if the display is running. If the display has been stopped it restarts the data sampling. This also resets the zoom level to the default of showing the whole scale.
  - Change Setpoint: Select this and a dialog appears to enter a new percentage (Figure 32) for the setpoint while connected and in Manual mode or Setup mode.

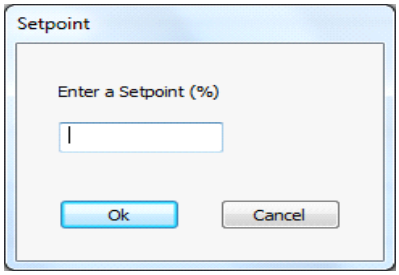


Figure 32 Change Setpoint

- Curve addition/subtraction: each of the curves available on the plot is listed with a checkbox to toggle their appearance on or off.
- Displays ongoing traces for % and psi versus Time. Traces shown include:
  - Position with blue
  - Signal Setpoint with yellow
  - Manual Setpoint with black
  - Supply Pressure with light blue
  - Actuator Pressure with light green
  - Bias with brown

5.8 Pencil/Exclamation Point

Throughout the use of the Masoneilan DTMs and ValVue3, there are two common indications that appear:

- Pencil (): This indicates that a field has been changed and there needs to be a save or a save and download to the device.
- Exclamation Point (!): This indicates that a field requires information or that the entry is not allowed.

6. SVI3 Dashboard

6.1 SVI3 Dashboard Screen

This screen displays information on positioner operations. To open this screen:

- Double-click **SVI3 Dashboard.**

Figure 33 SVI3 Dashboard Screen

Note: This discussion is restricted to the SVI3 Advanced DTM operations only.

Buttons and Fields

① *Information* in DTM Header	• Tag • Device Type/Rev • Firmware: Firmware revision • Device ID • Serial Number • DTM Version This data appears at the same location on all screens but can only be changed on the *Positioner Identification* screen (Section 8.2 “Advanced Setup: Positioner Identification”).
② *Mode* area	• Actual Mode • Target Mode These items appear at the same location on all screens and is used to view and change mode. See Section 5.3 “Actual Mode and Target Mode”.
③ *Signals* area	• *Temperature* - Displays the current temperature the positioner has read as a thermometer and text. • *Signal* - Displays the input analog signal strength expressed in mA of the configured signal range as an analog meter. The range is set on the Configuration screen (Section 8 “Advanced Setup”). • *Actuator Pressure* - Displays the pressure read from the sensor as an analog meter. The SVI3 continuously monitors the actuator pressure. It is displayed according to the configured units (psi, bar, or kPa). • *Supply Pressure* - Displays the supply pressure read from the sensor as a an analog meter. The SVI3 continuously monitors the pressure. It is displayed according to the configured units (psi, bar, or kPa).

④

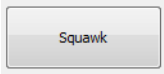
Position area

- The Position indicator shows the valve position graphically. The indicator consists of four parts:
- Setpoint (%) - User can manually change valve position through Setpoint under Manual mode or SETUP mode. In Manual or SETUP mode, the manual setpoint can be changed by dragging the upper arrow on the position indicator or clicking Set button next to the setpoint field. While dragging, the number in the center bar shows the selected manual setpoint and the setpoint value displays in the setpoint field.
- Valve Position indicator - Contains a center green bar showing the actual valve position in % of valve opening. The numerical valve position appears in the center. 0% is always closed and 100% is open.
    - Because the travel of a valve may exceed its nominal travel, positions greater than 100% are possible (see Section 8.12 “Advanced Setup: Control: Calibration”).
    - The range is set on the Section 8.5 “Advanced Setup: I/O Configuration: Input Signal”.
    - When SVI3 positioner enters SmartRecovery Control mode, the center green bar will show valve actual pressure and valve position in %.
- Signal (%) - Contains an indicator showing the value of the input signal. In Normal mode this is the position setpoint.

⑤

Status area

The *Status* area consists of:

- *Status* - Displays health indicators. When there is a fault code from the SVI3, *Additional Status Available* appears. The fault codes also appear on the *Status* screen (Section 9.13 “Diagnostics: Status: Faults”.) The status block also contains other status codes returned by HART. These include *Configuration Changed*, *Device malfunction*, and *Variable out of lim-its*. NE 107 status is displayed on Status Page and an Icon indicator on Status of Navigation. Refer Figure 33.
- 

- Sends the squawk command.

  Use the squawk command (HART Command 72) to assist technicians to find specific devices in an installation. With a HART 7 unit, you can send a temporary squawk where *Squawk* appears on the LCD display for two seconds.
- 

- Clears the *Configuration Changed Flag*, which clears the *Status*.

⑥

Positioner Control Mode

This area displays the actual control mode that the positioner is working on.

- 

- When the positioner is ready for Position Control mode, and “Automatic exit from SMartRecovery mode” is not set, a button “Switch to Position Control” appears in this area. User can manually switch the positioner to position control mode by the button.

7. Setup Wizard

7.1 Setup Wizard

Running the Setup Wizard automatically determines the preferred stop limits and tuning parameters based on the valve/actuator combination. Setup Wizard is the preferred and easiest method to calibrate the SVI3 to the valve with the single click of button. Once the wizard is complete, if necessary, you can use Section 8 “Advanced Setup” to customize or make further advance control settings. The Setup Wizard can dramatically reduce commissioning time in the field.

To run the Setup Wizard you must first be in Setup mode. See Section 5.3 “Actual Mode and Target Mode” for information on changing modes.

To see an explanation of the *Trend* graph and *Results & Log* right-click menus, see *Buttons and Fields* in Section 9.4 “Diagnostics: Online Diagnostics: Valve Health” and “Results and Log Right-Click Menu” in Section 9.7 “Diagnostics: Offline Diagnostics: Standard Signature” respectively.

Figure 34 Setup Wizard

To configure the items on this tab manually see Section 8 “Advanced Setup”.

7.1.1 Run the Setup Wizard

WARNING *This procedure moves the valve.*

1. Place the system in *Setup* mode.
2. Select the *Air Action*:
   - Air to Close
   - Air to Open.

A warning appears above and the procedure runs. During the procedure the *Trend* graph shows the valve function. If successful Figure 35 appears.

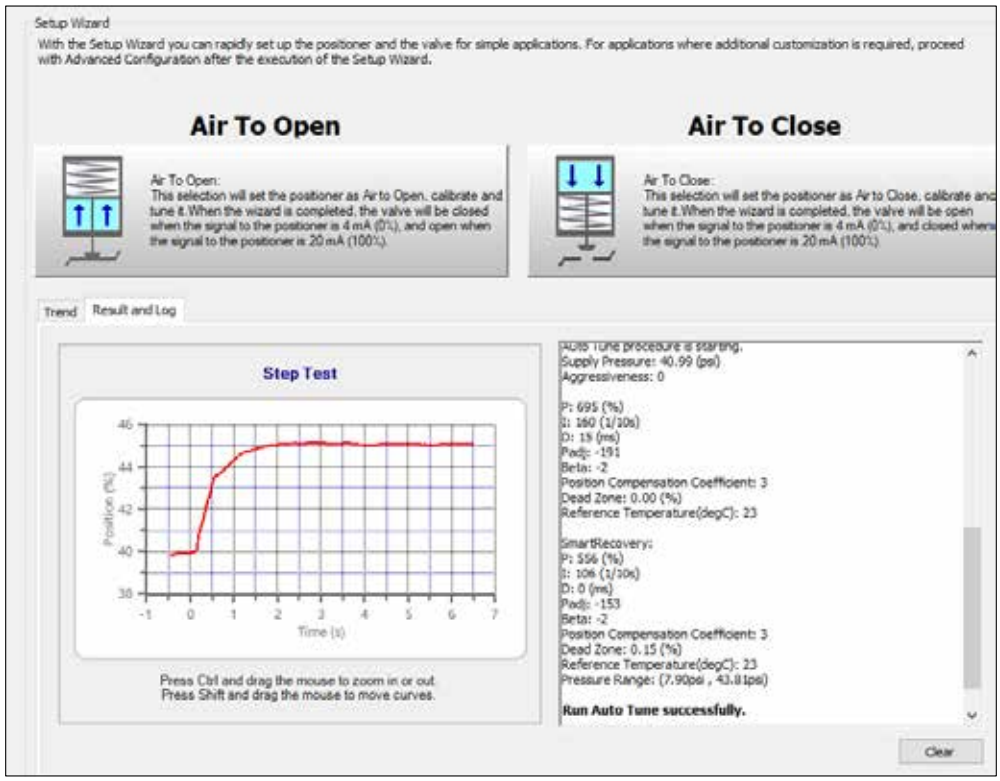


Figure 35 Setup Wizard Successful

Here you can see the Auto Tune result graphically and all the procedure results that run by Setup Wizard in the Result and Log area.

3. If the procedure is not successful, please check the valve, actuator setup including all accessories and try again. If it fails again, then we should refer Section 8.13 “Advanced Setup: Control: Tuning” to check and how to do manual tune or select a tuning slot.

8. Advanced Setup

8.1 Configuration

Use this screen to reset all offline configuration data to its default value including, Air Action, Travel, and PID parameters.

Figure 36 Configuration

8.1.1 Reset Data

To reset data:

1. Ensure you are in *Setup* mode.
2. Click Reset Basic Config and Cal To Defaults (only offline data). and Figure 37 appears.

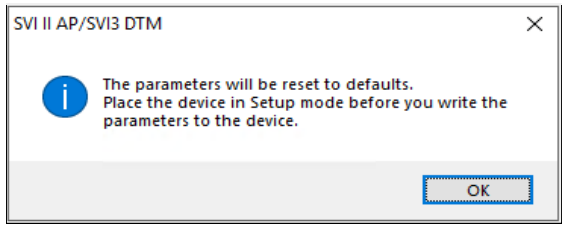


Figure 37 Reset Basic Config and Cal to Defaults Message

3. Click **OK**.

4. The user must download the DTM config to the SVI3 device by clicking Download button.

8.2 Advanced Setup: Positioner Identification

Use this screen to configure Tag, Description, Message information, display Model Code, Hart Revision, Diagnostic level and Mould information. You can configure the parameters on this screen in Normal, Manual and Setup mode.

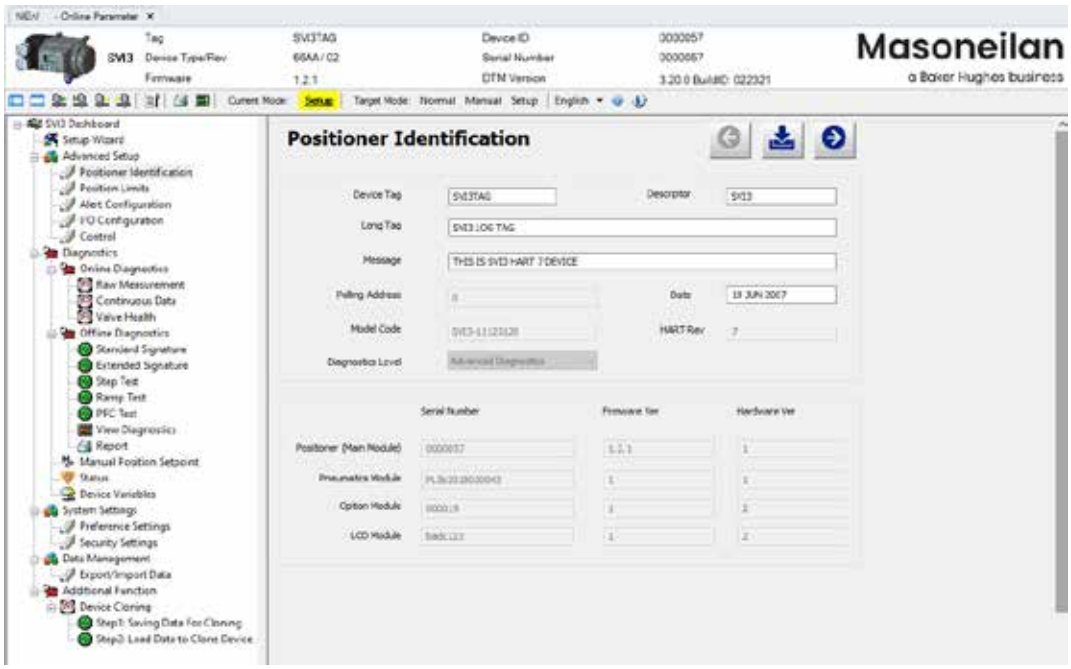


Figure 38 Advanced Setup: Positioner Identification

Buttons and Fields

Device Tag	Enter up to eight characters long and is used to identify the positioner in the system and appears throughout the program. This can be taken from a plant drawing or control diagram. Use by HART to identify the device.
Long Tag	Enter up to 32 characters long and is used to identify the positioner in the system and appears throughout the program.
Descriptor	Enter up to 16 characters for a description for the positioner.
Message	Enter up to 32 characters for a message associated with the positioner.
Date	Enter a date for when the unit went into service.

Note: The following fields are all read-only from the device.

Polling Address	Polling address used by the host to identify a field device; usually 0.
Model Code	Display the model ID of the positioner.
HART Rev	Displays the HART revision for the device.
Diagnostic Level	Displays the diagnostic level of the positioner: For SVI3, three diagnostic levels: Stadard, Advanced and Online Valve Diagnostics.
All Module	When connected to the positioner, presents the information for all detected modules (boards): • Positioner (Main Module): Must be present in all units. • Pneumatics Module: Must be present in all units. • Options Module: Optional module that can be installed at time of purchase or upgraded later. • LCD Module: LCD module that can be installed at time of purchase or upgraded later. The following data appears in the fields below for each: • Serial Number • Firmware Ver • Hardware Ver

8.2.1 Edit Positioner Identification

To configure these items:

1. Enter data as required into the text fields and pulldown lists.
2. Click  to download the changes to the positioner.

8.3 Advanced Setup: Position Limits

Use the *Position Limits* tab (Figure 39) parameters to limit the valve movement.

CAUTION

Position limit parameters is not for alerting the valve performance to be non-linear. Use them with caution and only when the process requires special performance.

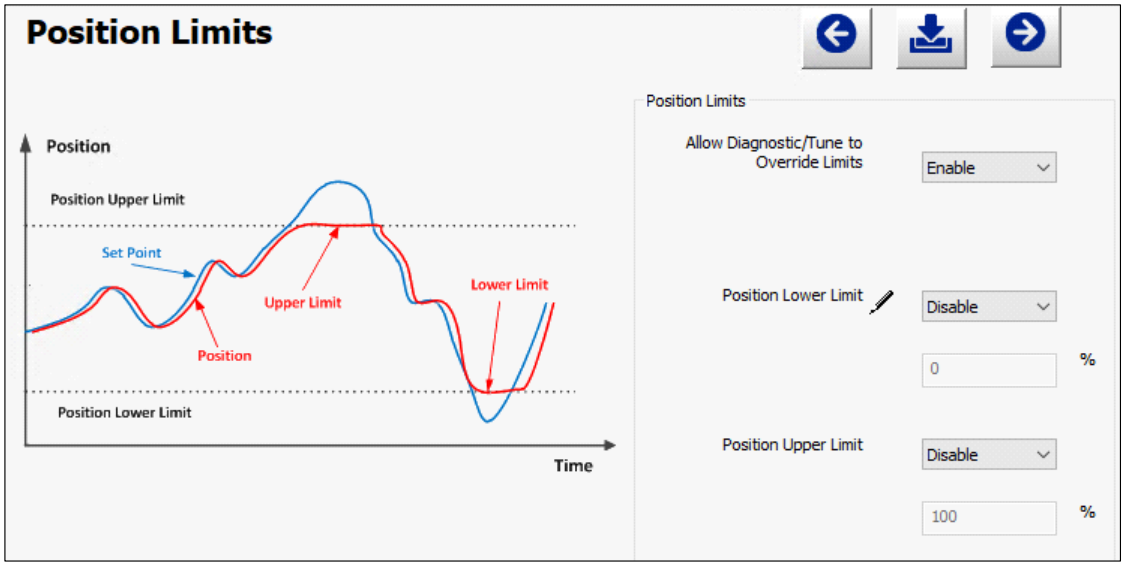


Figure 39 Advanced Setup: Position Limits

Buttons and Fields

Positioner Limits

Allow Diag/ Tune to Override Limits	Use this pulldown to enable/disable autotuning and offline Diagnostic Tests to override position limits. The override only extends to these two situations for tuning and diagnostics purposes; once the operations are complete position limits are obeyed.
Position Lower Limit	Activates a software limit stop. No valve position lower than this occurs when enabled. This is software only. During electrical/air failure, the valve moves to failsafe position. This stop is ignored during manual full open or close operations.
Position Upper Limit	Activates a software limit stop. No valve position higher than this occurs when enabled. This is software only. During electrical/air failure, the valve moves to failsafe position. This stop is ignored during manual full open or close operations.

8.4 Advanced Setup: Alert Configuration

Use the *Alert Configuration* screen (Figure 40) to set the Position Error Limits, set Fault Masks and set Valve Health Limits.

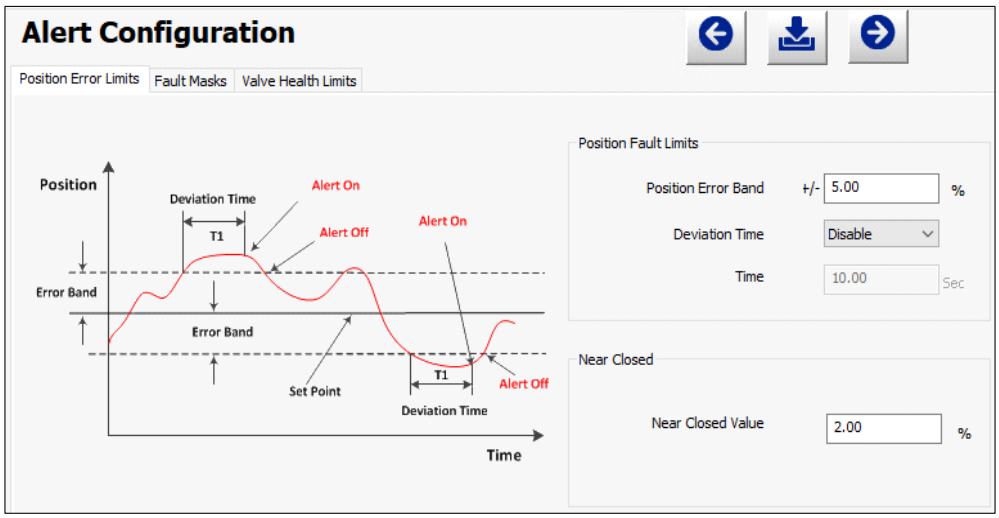


Figure 40 Advanced Setup: Alert Configuration

8.4.1 Position Error Limits

Use the Position Error Limits screen to configure the values for position deviation alerts and near closed values.

Buttons and Fields

Positioner Fault Limits

Position Error Band	Use this to configure how position errors are handled. A position error occurs when the valve position differs from the requested position (from the input signal in Normal mode or the manual setpoint in Manual mode) by more than the *Posi-tion Error Band* for more than the *Time*. When this occurs, a status Position Error is set which is reported during the next HART message. Only that a flag is set is reported. Ranges: .5 to 200% and 1 to 328 seconds.
Deviation Time	Use this pulldown to enable/disable the use of *Time*'s value. Activates a time field below.
Time	Enter a time after which if the *Position Error Band* is exceeded a flag is set.

Near Closed

Near Closed Value	Use the text field to enter a value that determines the value of position be-low which the valve is considered near closed by the continuous diagnostic calcula-tions. This value is defined as a percentage of the total partial stroke and must be between 0% and 20%. If you set a *Near Closed* value outside the range, a red exclamation point (**!**) appears.

8.4.2 Fault Masks

Use the *Fault Masks* screen (Figure 41) to mask specific faults from being annunciated via HART cmd 48. The screen is divided into a series of tabs that provide status, alarm, and fault information in a graphical form for all aspects of the system. *Fault Mask* is synchronized with *Mask Faults* (see Section 8.4.3 “Valve Health Limits”). For troubleshooting support, refer the fault matrix in IOM Manual. See Section 1.4.1 “Related Documentation for the SVI3 DTM” for further details.

Each alarm condition is color coded according to the criticality of the alarm:

- Low
- Medium (error conditions that can occur in normal operation, not faults, that may presently exist or have historically existed)
- High (indicates a fault)
- Indicates no faults

The window has selectable tabs that display the associated parameters for each tab. Mouse hover over a fault for a fault definition.

Figure 41 Advanced Setup: Fault Masks

Fault matrix of SVI3 has three new faults added: SmartRecovery Position Sensor Failed, SmartRecovery Position Error and SmartRecovery Active. On DTM Fault Masks page, if the check box “Ignore in CMD # 48” is grayed out, that means the fault cannot be masked by CMD # 48.

SVI3 Analog output supports to output Fail Low or Fail High signal when a configurable positioner fault occurs. User can configure Fail option on AO Output page. The configurable faults are marked with (*) on DTM Fault Masks page and Status page for user reference.

Buttons and Fields

Ignore in CMD #48

Click an individual checkbox to remove that fault's status from any Command 48 status updates. You must click  to complete configuration.

A warning dialog appears (Figure 42) asking to confirm the masking/ unmasking of the faults (s).

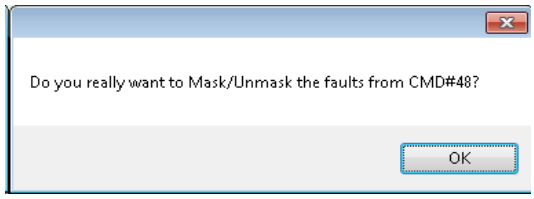


Figure 42 Mask/Unmask Faults in CMD #48

8.4.3 Valve Health Limits

The Valve Health Limits tab provides users with an interface to enable, configure the limits, and mask (hide) the alerts for the Online Valve Diagnostics KPIs (key performance indicators).

The Valve Health Limits tab is visible only when the diagnostic level of the positioner is Online Valve Diagnostics. For Standard Diagnostics and Advanced Diagnostics editions of the positioner, only Position Error Limits and Fault Masks two tabs are presented to the user.

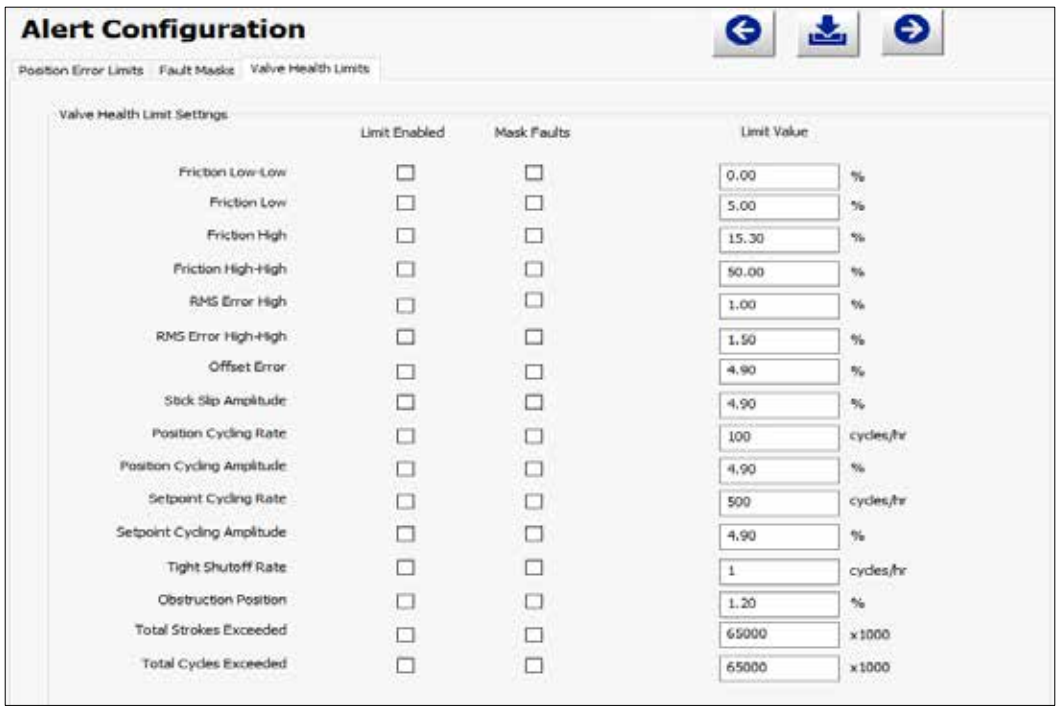
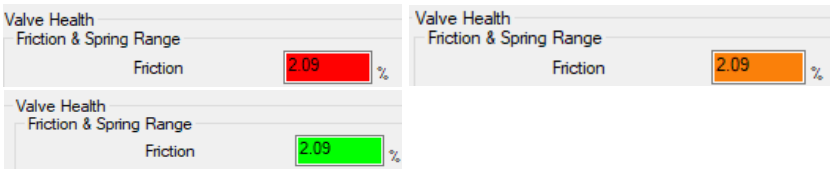


Figure 43 Advanced Setup: Configuration: Valve Health Limits

Buttons and Fields

Limit Enabled	Activates the Limit Value field to right to entry a value.
Mask Faults	*Faults* Enables/disables the reporting of the selected fault by HART command48. This only masks the fault - the fault can still exist. This useful if a particular fault is not important on your system.
Friction Low-Low *Friction Low* *Friction High* *Friction High-High*	The program calculates friction as an estimate of friction plus deadband. Friction and friction limits are represented in percentage values of spring range. Spring range is the difference between spring initial (force it takes to get valve moving) and spring final (force it takes to get valve in fully open position), Units are in percentage values. These 4 options are related to the “Friction” field in Valve Health page, different settings in these 4 options will made the “Friction” field change to different colors. When you check the check boxes and input limit values “LL, L, H,HH(LL<=L<=H<=HH)” for these four options respectively, assume the actual Friction read from firmware is F. It will have the following relations: Red: F<LL Orange: LL<F<L Green: L<F<H Orange: H<F<HH Red: F>HH 
RMS Error High *RMS Error High-High*	Error is the root mean square (RMS) error, which is the amount of deviation between the setpoint and the valve position. Units are in percentage values. Alarm indicator color will have the following relations with RMS Error and input limit values (H, HH): Orange: RMS Error>H Red: RMS Error>HH
Offset Error	The one-sided error of position from setpoint. If the offset is outside of plus or minus the offset limit, an alarm is set. Units are in percentage values.
Stick Slip Amplitude	Because of high static friction, a valve can stick in position when called to move and then break free when enough force has been applied. This is called stick-slip. The program computes an index that indicates if stick-slip is occurring. This index is larger when stick- slip is more pronounced. If this index is greater than the error limit, then an alarm indicator is set.
Position Cycling Rate	The cycle rate is the number of times the position changes direction per hour. When the cycle rate exceeds the limit, an alarm indicator is set.
Position Cycling Amplitude	The cycle amplitude is the average peak-to-peak value of the position changes in direction. When the amplitude exceeds the limit, an alarm indicator is set.

Setpoint Cycling Rate	The setpoint cycle rate is the number of times the setpoint changes direction per hour. When the cycle rate exceeds the limit, an alarm indicator is set.
Setpoint Cycling Amplitude	The setpoint cycle amplitude is the average peak-to-peak value of the set-point changes in direction. When the amplitude exceeds the limit, an alarm indicator is set.
Tight Shutoff Rate	If a valve is controlled near the seat and tight shutoff option is On, it is possible for the valve to go below the tight shutoff limit and close, followed by the control system opening the valve. This can occur repeatedly. This is called tight shutoff cycling. If the number of times in a test that the valve cycles at the seat in this way exceeds the error limit, an alarm indicator is set.
Obstruction Position	An obstruction is detected, when the valve pressure /position relationship is far different than expected. For example, if the actuator pressure is 1 PSI for 3-15 PSI actuator, we expect that the valve is closed. But if the valve is 35% open, that is an indication that the valve has hit an obstruction (most likely a break) and cannot close.
Total Strokes Exceeded	An accumulated value of 100% travel = 1 stroke, where the travel does not need to occur in one movement.
Total Cycles Exceeded	A count of the number of direction changes in the position of the valve in one minute. If the number of cycles exceeds the cycle limit, an alarm indicator is set.

8.5 Advanced Setup: I/O Configuration: Input Signal

Use this tab to:

- Set the input signal range.
- Calibrate the loop current zero or the loop current gain to match what is physically measured.
- Configure Split Range where a single control output is sent to two or more control valves. Each control valve positioner is calibrated to respond to a separate portion of the control signal.

Note: See Split Range in the Masoneilan SVI3 Digital Positioner Advanced Performance Installation and Maintenance Manual for instructions.

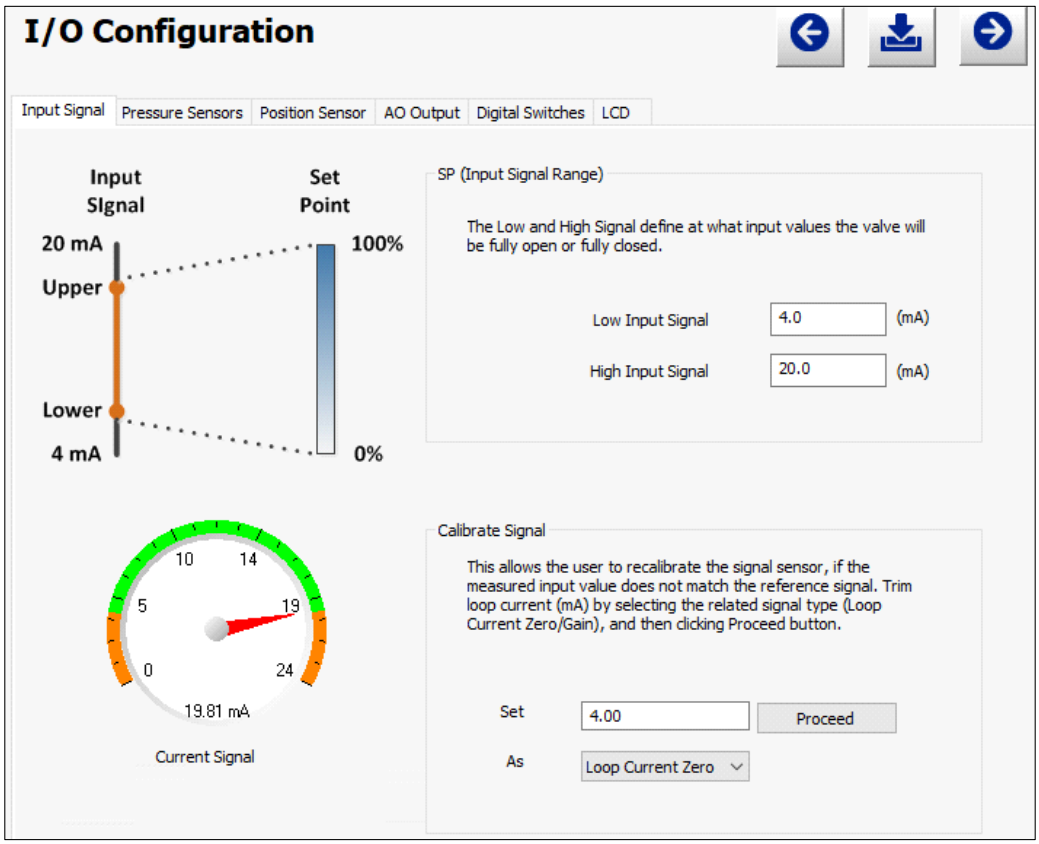


Figure 44 Advanced Setup: I/O Configuration: Input Signal

Buttons and Fields

SP (Input Signal Range)

Input Signal to Setpoint graphic	Shows the relationship between the valve position input signal and valve sepoint (static only).
Low Input Signal	Enter the input signal low range value for valve closed (Air To Open) or valve open (Air To Close). Range: 3.8 to 14 mA. The span between lower and upper range must be 5 mA.
High Input Signal	Enter the input signal high range value for valve open (Air To Open) or valve closed (Air To Close). Range: 8 to 20.2 mA. The span between lower and upper range must be 5 mA.

Calibrate Signal

Set field	Input the value physically measured.
As pulldown	Use the pulldown to select either **Loop Current Zero** or **Loop Current Gain**.
Proceed button 	Click this button to calibrate the signal.
Current Signal graphic	Displays the value of the signal in mA.

8.5.1 Set Loop Current Zero or Loop Current Gain

1. Ensure the SVI3 is in *Setup* mode.
2. Input the value physically measured.
3. Use the pulldown to select either **Loop Current Zero** or **Loop Current Gain**.
4. Click 

8.6 Advanced Setup: I/O Configuration: Pressure Sensors

Use this tab to set pressure units, monitor all pressures, and recalibrate pressure sensors at zero psi.

The pressure sensor is calibrated at the factory and does not usually require recalibration, but if needed, this dialog provides a convenient method. The currently measured value of pressure or signal is displayed and can be compared to reference pressures to see if recalibration is necessary.

Note: For single-acting, Actuator Pressure 2 displays N/A.

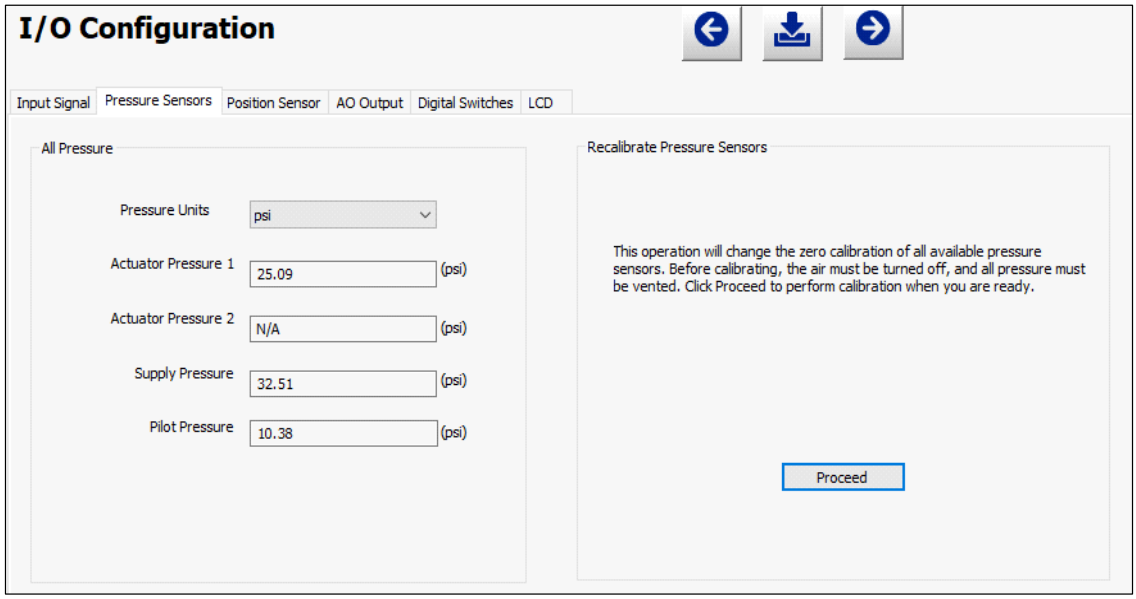


Figure 45 Advanced Setup: I/O Configuration: Pressure Sensors

Buttons and Fields

Calibrate Pressures

Pressure Units	A pulldown list for selecting the pressure units for use: *psi*, *bar* or *kPa*.
Actuator Pressure 1	Displays the measured pressure value of the output of the positioner to the actuator.
Actuator Pressure 2	Displays the value detected. The value should always be N/A.
Supply Pressure	Displays the measured pressure value of the input supply pressure.
Pilot Pressure	Displays the measured pressure value of the output of the I/P.
Proceed button 	Click this button change zero calibration of all available pressure sensors.

8.6.1 Set Sensors Zero Calibration

Note: Prior to performing pressure calibration all air must be turned off and all pressures vented. This procedure references a measuring instrument capable of reading +/- 0.01 psig.

1. Ensure the air supply is turned off.
2. Vent the valve/positioner..
3. Ensure the SVI3 is in *Setup* mode.
4. Click 
5. Pressure calibration will be performed.

8.7 Advanced Setup: I/O Configuration: Position Sensor

Use this tab to configure the position sensor as either build-in or remote position.

For Remote Position Sensor or Analog PV Remote Sensor, it is a remotely mounted position-sensing device, that can be connected electrically to a digital valve positioner or other suitable field device. It is used as position feedback in applications where direct mounting of a positioner to a valve actuator is not practical due, typically but not limited to, extreme vibration, heat or radiation.

Note: Ensure the remote position sensor unit is installed as per manufacturer instructions. For Masoneilan's RPS see Masoneilan™ Remote Position Sensor Quick Start Guide, which is downloadable at [https://valves.bakerhughes.com/resource-center.](https://valves.bakerhughes.com/resource-center)

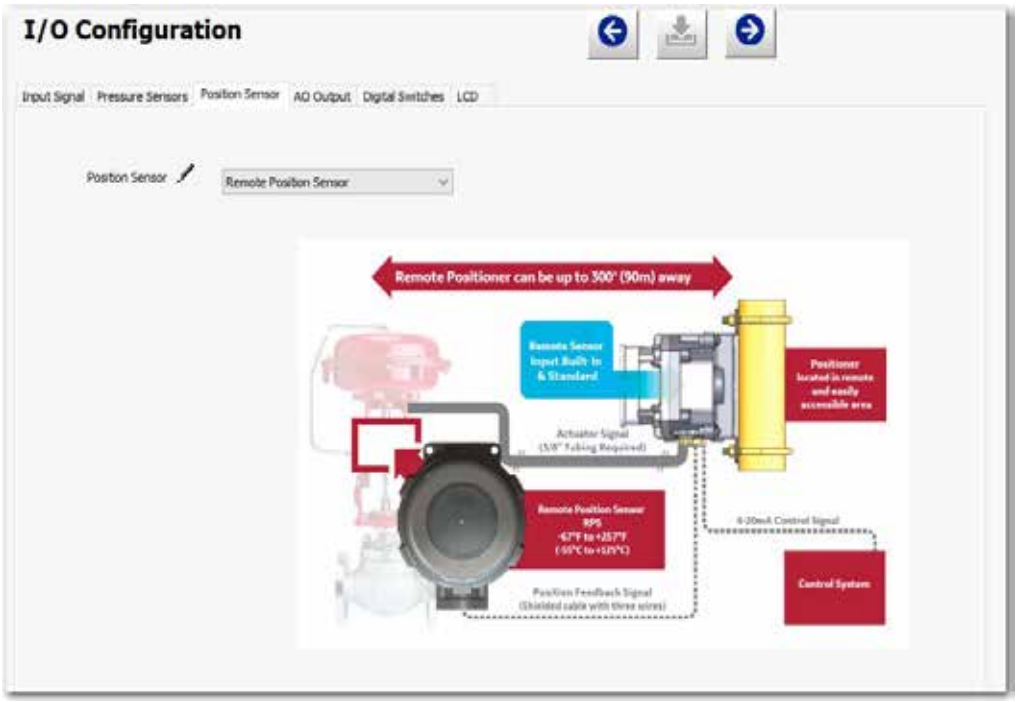


Figure 46 Advanced Setup: I/O Configuration: Position Sensor

Note: The Remote Position Sensor is allowed only if the Options module is physically present.

Buttons and Fields

Position Sensor A pulldown list for selecting the position sensor type: *Internal Position Sensor, Remote Position* or *PV Analog Position Sensor*.

8.7.1 Set Position Sensor

1. Ensure the SVI3 is in *Setup* mode.
2. Use the position sensor pulldown to select: **Internal Position Sensor, Remote Position** or **PV Analog Position Sensor**.
   A warning dialog appears (Figure 47).

Figure 47 Warning Dialog

3. Click  to download to the device.

8.8 Advanced Setup: I/O Configuration: AO Output

Use this tab to:

- Change the configuration for the re-transmitter option for closed at 4 mA/open at 20 mA to closed at 20mA/open at 4 mA.
- Set a fixed analog output for the position retransmitter for a loop wire check. This is part of the optional Option Module and is grayed out if not present.
- Configure retransmitter Fail Option per NAMUR NE-43 standard.

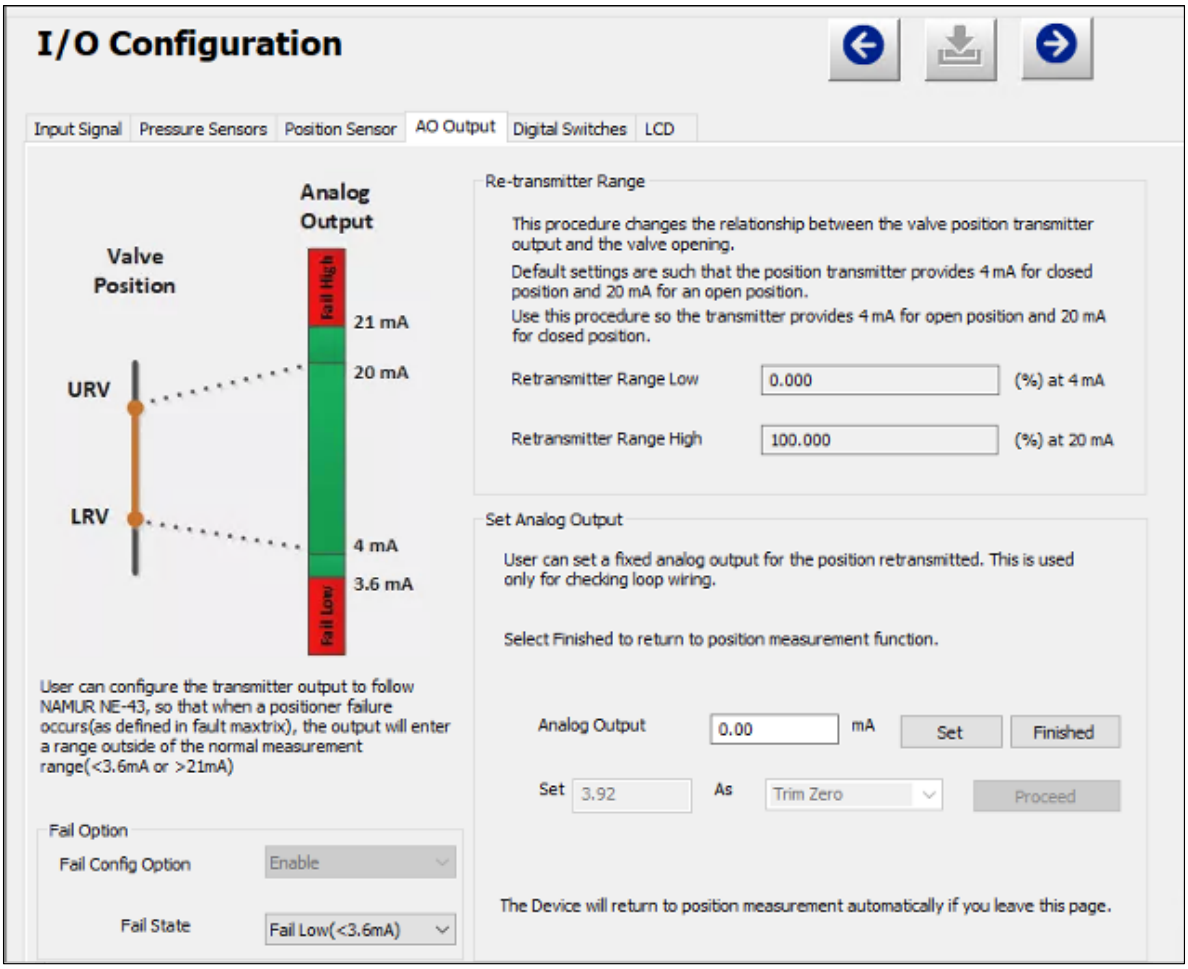


Figure 48 Advanced Setup: I/O Configuration: AO Output

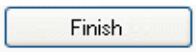
Notes: The AO Output configuration is allowed only if the Options module is physically present. 0% is always valve closed, and 100% is always valve open.

Buttons and Fields

Re-transmitter Range

Retransmitter Range Low	Enter a position for the valve in percent for the closed (4 mA) position.
Retransmitter Range High	Enter a position for the valve in percent for the open (20 mA) position.

Set Analog Output

Analog Output	Enter a fixed value for the position retransmitter. Click Finished button to return position measurement.
Set button 	Click to set the value for the loop test.
Finish button 	Click to place the system back into position measurement mode.
Set	Enter a value associated with the trim type (mA).
As	Use the pulldown to select the trim type to: • Trim Zero: This is usually 4 mA, but can be set between: 3.5 to 8 mA. *Trim Gain*: This trims the mA span of the device. can be set between: 16 to 22 mA. For example, if the measured zero point is 3.9 mA and user wishes to trim that to 4mA, you would do the following: edit 4.0 mA in the Analog Output, click Set, then set 3.9 As Trim Zero, click Proceed. This only works in setup mode.
Proceed button 	Click to set the value for the trim type selected.

8.8.1 Set Retransmitter Range

1. Ensure the SVI3 is in *Setup* mode.
2. Enter a value into the *Retransmitter Range Low* and *Retransmitter Range High* fields.
3. Click  to download to the device.

8.8.2 Set Analog Output

1. Ensure the SVI3 is in *Setup* mode.
2. Install a multimeter in your setup appropriately to measure current.

3. Enter a value into the *Analog Output* field.
4. Click Set to observe the current.
5. Click Finished to complete the test and return the positioner to position measurement.

8.8.3 Set Trim

1. Ensure the SVI3 is in *Setup* mode.
2. Install a multimeter in your setup appropriately to measure current.
3. Enter a value into the *Set* field.
4. Select **Time Zero** or **Trim Gain** and click Proceed to observe the current.
5. Click Finished to complete the test and return the positioner to position measurement.

8.8.4 Fail Option

1. User can configure the transmitter output to follow NAMUR NE-43. When a configurable fault occurs, the output will enter a range outside of the normal measurement range (< 3.6 mA or > 21 mA). Note this feature of Fail Option is not available in SVI3 Rev1 device.
2. On DTM Fault Masks page and Status page, all configurable faults are marked with (*).

8.9 Advanced Setup: I/O Configuration: Digital Switches

Use this tab to default operating position for the digital input and two digital output switches.

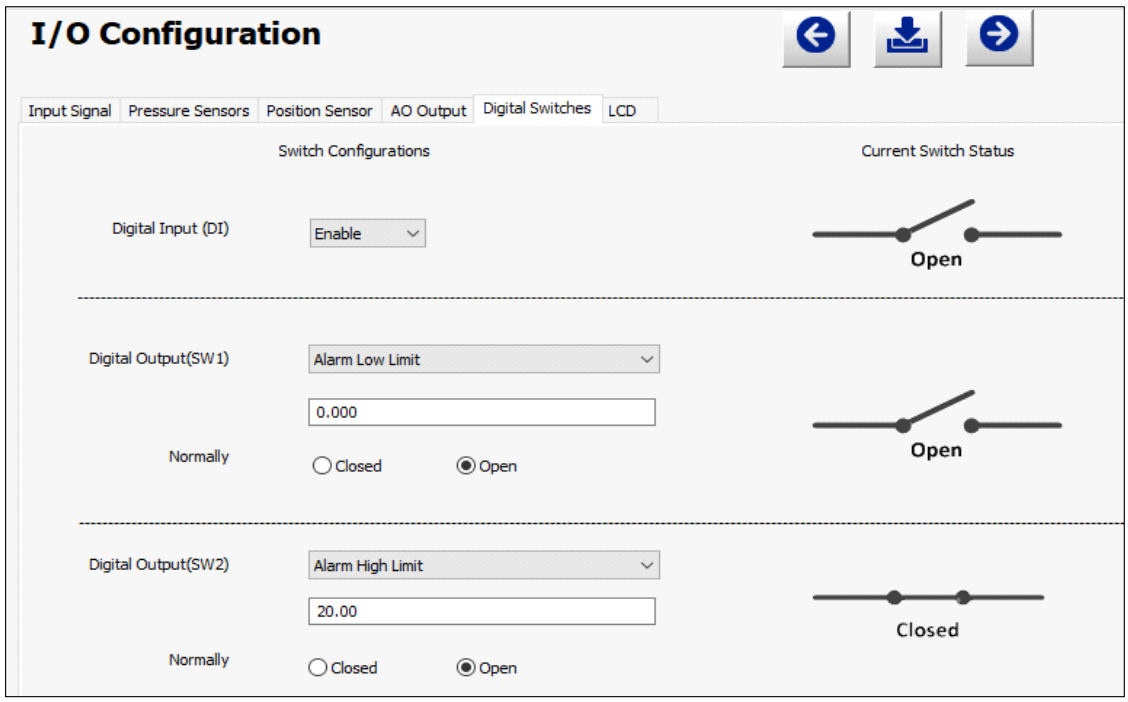


Figure 49 Advanced Setup: I/O Configuration: Digital Switches

Note: The DI/DO switch configuration is allowed only if the Options module is physically present.

Note: The contacts are OPEN when the SVI3 is unpowered and may be made to be open or closed when the flag is asserted after boot.

8.9.1 Digital Input

Use the Digital Input to enable or disable the sensing of external switch contact.

Buttons and Fields

Digital Input (D/I) Use the pulldown to enable/disable this switch.

8.9.1.1 Set Digital Input Switch

1. Ensure the SVI3 is in *Setup* mode.
2. Use the associated pulldown to enable/disable.
3. Click  to download to the device.

8.9.2 Digital Output

Use the Digital Output to enable or disable the sensing of internal switch contact and configure the action of those contacts based on various SVI3 conditions.

8.9.3 Current Switch Status

After digital switch configuration is downloaded, use Current Switch Status to verify switches' open/close status.

Buttons and Fields

Digital Output (SW1)/Digital Output (SW2)	The SVI3 supports two identical contact outputs which can be logically linked to status bits. The two output switches can be opened or closed in response to conditions that the SVI3 detects.
DO1 Function/ DO2	Use this pulldown to select the type of action: • Disable - The default configuration setting of the digital output is disable which means the switch is not controlled by the SVI3 and will not switch for any valve travel. To activate the switch at a given valve position, configure the switch such as Alarm Low Limit or Alarm High Limit. • Failsafe - The switch is activated when the SVI3 is in Failsafe mode • Reset - The switch is activated whenever a reset has occurred and the switch remains activated until the SVI3 status is cleared • Position Error - The switch is activated whenever a position error has occurred and is deactivated when the position recovers to the correct position • Tight Shutoff Active - The switch is activated whenever the device is in tight shutoff (tight shutoff is on and the valve position is less than the tight shutoff position). • Alarm Low Limit - The switch is activated whenever the valve position is less than the position setting of this switch control. • Alarm High Limit - The switch is activated whenever the valve position is greater than the position setting of this switch control. • Manual or Out of Service Mode- The switch is activated whenever the SVI3 is in Manual or Out of Service mode. • SmartRecovery Mode - The switch is activated when the SVI3 is in SmartRecovery Mode
Normally Closed or Open	Set the default status of the switch as Closed or Open. If the switch default status is set as Closed, the switch turns to Open once the switch is activated.
Digital Output (SW1) Value/ Digital Output (SW2) Value	Use this to set the switch Alarm limit.

8.9.2.1 Set Digital Output Switch

1. Ensure the SVI3 is in *Setup* mode.
2. Use the associated pulldown to select a condition:

- Disable
- Position Error
- Alarm High Limit
- Failsafe
- Tight Shutoff
- Manual or Out of Service Mode
- Reset
- Alarm Low Limit
- SmartRecovery Mode

CAUTION

If both Alarm Low Limit and Tight Shut Off are used, the Alarm Low Limit must be above the Tight Shut Off.

3. Use the value field below to enter a limit setting (*Alarm Low Limit* and *Alarm High Limit* only).
4. Click either the **Closed** or **Open** radio button.
5. Click 

8.10 Advanced Setup: I/O Configuration: LCD

Use this tab to set the permissions level for the local buttons and to set the LCD language.

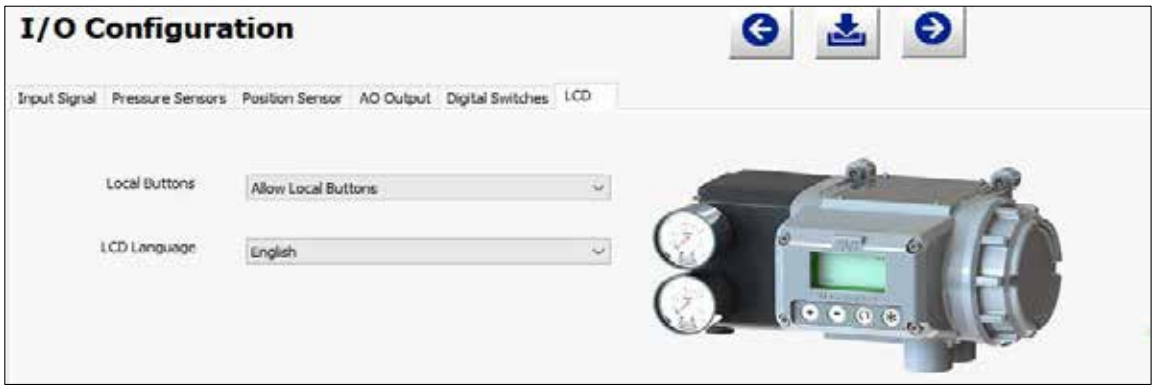


Figure 50 Advanced Setup: I/O Configuration: LCD

Buttons and Fields

Local Buttons — A pulldown list to select security level for SVI3 pushbuttons. The SVI3 comes with an optional local display and buttons can be used to perform basic SVI3 setup without the need for DTM or a handheld. It may, however, be desirable after initial setup to *lock* the buttons so that the SVI3 parameters cannot be inadvertently changed from the buttons. Several level of locks are provided:

- Allow Local Buttons: All buttons on the SVI3 are enabled.
- Lock out Local Cal-Config (level 2): You can use the buttons to perform operations in Normal mode and Manual mode, but not in Setup mode.
- Lock out Local Manual (level 1): You are precluded from Manual and Setup mode but can perform normal operations in Normal mode.
- Lock out All Buttons (level 0): All buttons are disabled.

LCD Language — A pulldown list to select what language the valve positioner display its menu in: English or French on the DTM.

8.10.1 Set Local Buttons Configuration

1. Ensure the SVI3 is in *Setup* mode.
2. Use the associated pulldown to choose the permission level.
3. Click  to download to the device.

8.10.2 Set LCD Language

1. Ensure the SVI3 is in *Setup* mode.
2. Use the associated pulldown to select a language.
3. Click  .

8.11 Advanced Setup: Control: Actuator

Use this screen to select the *Air to Action* type and view the type of actuator: *Single Acting* is factory set.

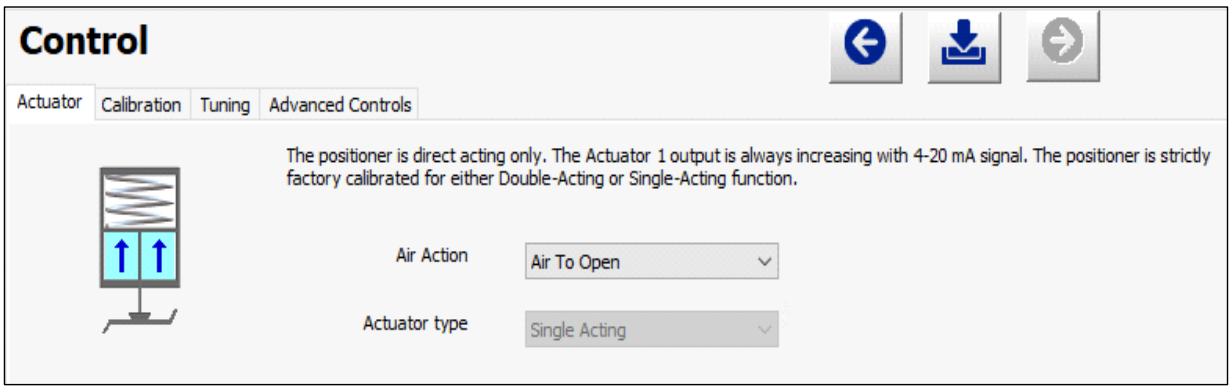


Figure 51 Advanced Setup: Control: Actuator

8.12 Advanced Setup: Control: Calibration

Use the *Calibration* screen to perform manual, automatic Find Stop and open stop adjustment.

8.12.1 Auto Find Stops

Use this screen to perform an automatic find stops procedure. This sets the calibration position of the valve at the fully vented position and at full supply pressure.

To determine valve position, the positioner must measure and save the closed and open positions of the valve. The SVI3 first exhausts the actuator and measures the position, then fills the actuator and measures the position. From these measurements the valve position can be determined. Correction can be made for nominal valve travel if it is less than full travel.

CAUTION

*Procedures (e.g. Find Stops, Auto Tune, Step Test, Ramp Test, Signature) should **NOT** be invoked if the ValVue sequencer is running.*

Figure 52 Advanced Setup: Control: Calibration

Buttons and Fields

Counts vs. Time graph

Use this graph to graphically see the counts versus time during the Find Stops procedure.

See Figure 52 for a full description of functionality.

- Left axis displays raw positioner sensor value.
- Bottom axis displays time.
- Click-and-hold on any axis' legend to drag along the axis.
- The red line represents a HIHI alert condition.
- The yellow represents a HI alert condition.
- Press the CTRL button and mouse drag to zoom/unzoom on the graph.
  The magnet graphic displays the rotation real-time degree of the magnet sensor:
- -56° to 56° green appears
- -56° to -70° or 56 to 70° yellow appears
- Less than -70° or greater than 70° red appears

Note: Valve can operate only in the green and yellow regions.

Raw Sensor Value

Displays the temperature compensated value; in counts. The value typically is:

- between -18415 and +18415 counts when Position Sensor is Internal Position Sensor
- between -5500 and 30500 counts when Position Sensor is Remote Position Sensor
- between +800 and +5200 counts when Position Sensor is PV Analog Position Sensor (For SVI3REV01)
- between +3200 and +20800 counts when Position Sensor is PV Analog Position Sensor (For SVI3REV02)

Just below that a percentage appears that represents the angle computed using the raw sensor value.

Position vs. Time graph

Use this graph to graphically see the position versus time during the Find Stops procedure. See Figure 52

- Left axis displays a scale for the position (blue trace).
- Bottom axis displays time.
- Click-and-hold on any axis' legend to drag along the axis.
- Press the CTRL button and mouse drag to zoom/unzoom on the graph.

Position

Displays the position determined from the procedure.

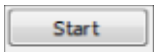
Find Stops Log

Displays device nameplate information, procedural messages during the runtime and results.

Auto Find Stops

WARNING

Tuning strokes the valve over its entire travel. Isolate the valve from the process prior to calibration.

1. Ensure the system is in Setup mode.
2. Click **Auto Find Stops**.
3. Click 

, the two graphs beginning showing results, the *Find Stops Log* lists detected values, test results appears (Figure 52) and if the test fails a list of reasons.

8.12.2 Manual Low Stop Limit/ Manual High Stop Limit

On some actuators, it is possible that the *Auto Find Stops* procedure will not find the correct end positions of the travel. A semi-automatic method of calibrating the stop positions is provided.

These move the valve to either the full closed or full opened and you respond when the valve reaches the closed or open position.

For some valves where the travel exceeds the nominal travel of the valve, use *Open Stop Adjustment* for details about how to trim the open stop.

Buttons and Fields

Manual High Stop Limit	Use this radio button to perform a procedure that sets the *High Stop Limit*

WARNING

Tuning strokes the valve over its entire travel. Isolate the valve from the process prior to calibration.

1. Ensure the system is in Setup mode.
2. Click **Manual Low Stop Limit.**

3. Click Start , the two graphs beginning showing results. The test seeks the *Low Stop* position and the button appears.

CAUTION

Ensure that the Raw Sensor Value stabilizes before proceeding.

4. Click Accept and the Confirm button appears.

5. Click Confirm , the *Find Stops Log* lists detected values, test results appears (Figure 53) and if the test fails a list of reasons.

Figure 53 Manual Low Stop Limits Results: Succeeded

Manual High Stop Limit

WARNING

Tuning strokes the valve over its entire travel. Isolate the valve from the process prior to calibration.

1. Ensure the system is in Setup mode.
2. Click **Manual High Stop Limit**.
3. Enter and *Open Stop Adjustment* value. Refer Section 8.12.3 “Open Stop Adjustment”.
4. Click Start , the two graphs beginning showing results. The test seeks the *High Stop* position and the Accept button appears.

CAUTION

Ensure that the Raw Sensor Value stabilizes before proceeding.

5. Click Accept and the Confirm button appears.
6. Click Confirm , the *Find Stops Log* lists detected values, test results appears (Figure 54) and if the test fails a list of reasons.

Figure 54 Manual High Stop Limits Results: Succeeded

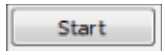
8.12.3 Open Stop Adjustment

Recomputes the position scale so that at the value entered in the open stop adjustment edit box as a percent of full stops, the position reads 100%.

In some valves the travel exceeds the nominal valve travel. You can compensate for this so that the valve position reads 100% at the nominal travel. When Open Stop Adjustment setting is changed, the Pressure Range for SmartRecovery will be rescaled automatically.

Figure 55 shows how this works. This calibrates the position with the full travel of the valve.

Buttons and Fields

Open Stop Adjustment	Use this field and to  recompute the position scale.

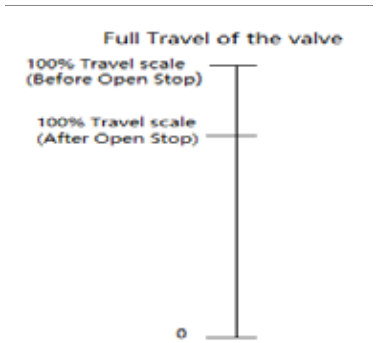


Figure 55 Open Stop Adjustment Diagram

8.13 Advanced Setup: Control: Tuning

Use the *Tuning* screen to perform all automatic tuning, custom tuning operations and view the results of tuning parameters on the *Trend* display and *Results and Log*.

Actuators that may require manual tuning include:

- Actuators with internal leaks, such as pistons.
- Large actuators with high spring ranges.

Additionally, this screen provides access to the *Live Tuning* dialog (Section 8.13.3 “Live Tuning”).

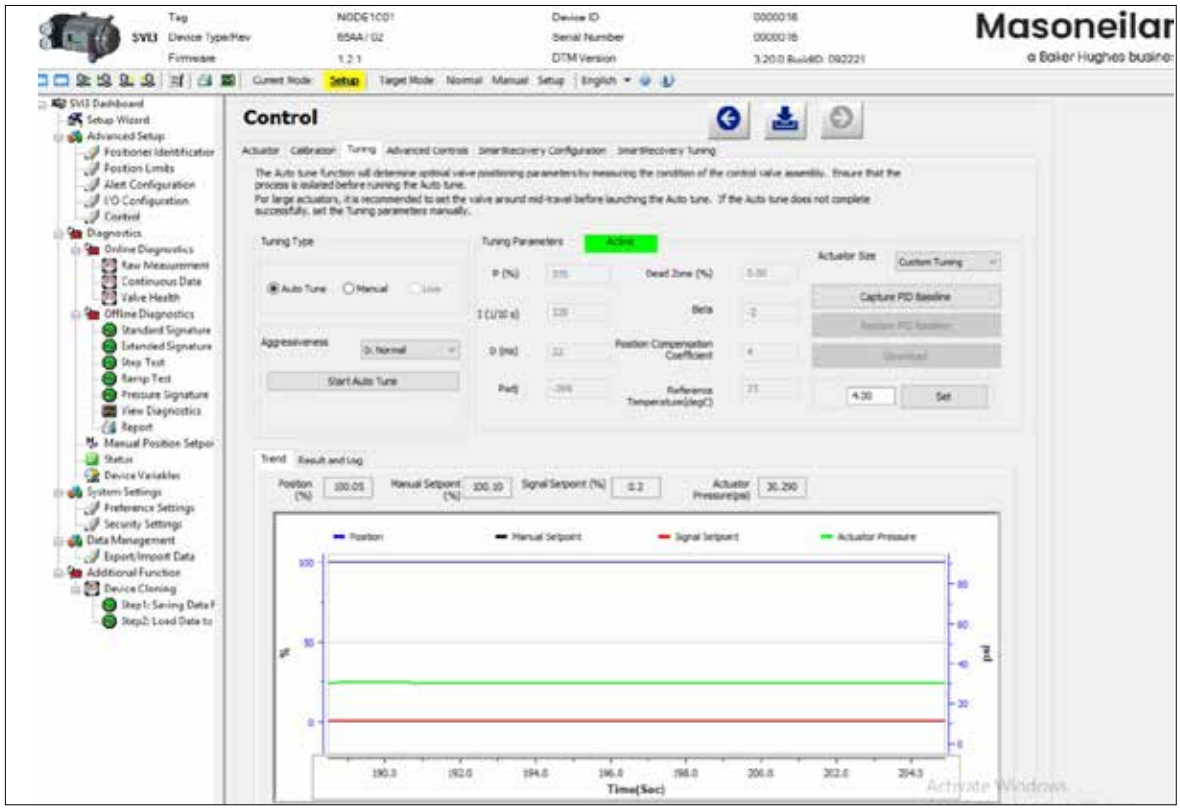


Figure 56 Advanced Setup: Control: Tuning

Buttons and Fields

Tuning Type	Click a radio button to start one of the three tuning types: • Auto Tune: See Section 8.13.1 “Auto Tune”. • Manual: See Section 8.13.2 “Manual Tune”. • Live: See Section 8.13.3 “Live Tuning”.
Aggressiveness	This is a setting for Autotune, and auto tune must be run to implement the value into the positioner. The value that tunes the valve to either fast response or overshoot. Higher aggressiveness leads to higher gains and generally faster valve performance. This can cause more overshoot.
	
Start Auto Tune button	Click to start the Auto Tune process. See Section 8.13.1 “Auto Tune”.
Tuning Parameters	Activates if Auto Tune is unsuccessful so that a manual tune can be done or if manual tune is selected.
	When Active shows up, it indicates that device is running in position control.
P	Proportional gain in %. Common values for the positioner are 0 for small valves up to 4000 for large valves.
I	Integral time or reset time in 1/10th sec, is the time constant of integral control. Higher values of I cause less integral action. *0* gives no integral action. Common values are 10 to 200.
D	Derivative time or rate time (msec) is the time constant of derivative control. Common values are 10 to 100.
Padj	Valves often have significantly different response when filling verses exhausting. The proportional gain is adjusted by adding *Padj* (%) to *P* when the valve is exhausting.
Dead Zone	When the valve position is within the setpoint +/- the dead zone, no additional position control is performed. This value is normally 0%, however for high friction valves (e.g. valves with graphite packing) a higher dead zone (%) helps avoid limit cycling due to the stick/slip action of the valve. In these cases the dead zone chosen might be 0.5% to 1%. Range: 0 to 5%.
Beta	This is a nonlinear gain factor, ranging from -9 to 9. When Beta is 0, the controller gain is linear. Otherwise, the gain is the function of error. The larger the beta, the smaller the gain for small error.
Position Compensation	The response of the valve is different when the valve is nearly closed than when the valve is nearly open. The position compensation coefficient, which is a number between 0 and 20, make adjustments to try to equalize the valve response. The normal value is 6. For springless actuators the value is 15.
Reference Temperature	Refers to the temperature at which the control parameters were tuned. For example, if current temperature is 40°C when you successfully run autotune, the reference temperature is 40.

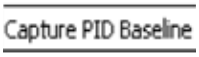
Actuator Size

Use this pulldown to select an actuator size closely related to your specific needs. The user can use Auto Tune or use the Tuning tab to enter values from similar sized configurations before using presets. Choices include:

- Custom Tuning: Set your values on the Tuning tab.
- Tiny(ΔSR: 15-24)
- Small(ΔSR: 7-12)
- Small(ΔSR: 15-24)
- Medium(ΔSR: 7-12)
- Medium(ΔSR: 15-24)
- Large(ΔSR: 7-12)
- Large(ΔSR: 15-24)

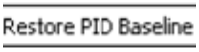
The table below relates the settings above to some spring ranges and actuators sizes for single applications, as well as some examples using Masoneilan products:

Single Acting (SA)	Actuator Size	Spring Range Difference for SA (psi)	Examples For Single Acting without Boosters
0	Tiny	7-12	Tuning Set 0 reserved for custom or auto tuning
1	Tiny	15-24	Varipak 6-24 psi
2	Small	7-12	87/88, Size #6: 3-15, 11-23 psi ; 4.5" Camflex 7-15 psi
3	Small	15-24	87/88, Size #6 , 6-30, 11-15, 21-45 psi
4	Medium	7-12	87/88, Size #10: 3-15, 11-23 psi
5	Medium	15-24	87/88, Size #10: 6-30, 11-15, 21-45 psi; 7"&9" Camflex 7-24 psi
6	Large	7-12	87/88, Size #16, #23: 3-15, 11-23 psi
7	Large	15-24	87/88, Size #16, #23 , 6-30, 11-15, 21-45 psi



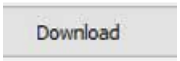
Capture PID Baseline button

Click and the PID results are saved as the baseline PID results. The baseline data set represents the best example of proper valve/positioner function.



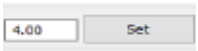
Start Auto Tune button

Click and the PID results most recently saved as the baseline set are restored. The baseline data set represents the best example of proper valve/positioner function.



Start Auto Tune button

Click to download to the positioner.



Start Auto Tune button

Click to move valve and monitor the valve response in the *Trend*. This useful as a check of recently set tuning parameters.

Trend	See Section 9.6 “Diagnostics: Offline Diagnostics” for an explanation of functionality.
Result & Log	Displays the results by test for each test parameter reported and a log of activity during the test.

8.13.1 Auto Tune

Use *Autotune* (Figure 56) to run autotune.

The SVI3 has a built-in positioning Autotune feature. This feature automatically computes the optimal parameters for the positioning algorithm. The algorithm analyzes the dynamic behavior of the valve assembly, and determines optimal values for the tuning algorithm for tight and accurate position control. The autotune will provide two sets of control parameters, one for Position Control and another one for SmartRecovery (pressure) Control.

Auto tune results appear after the process completes, and a graphical curve appears in the *Trend* area below with *Results & Log* displaying non-graphic test sequence and result.

Auto Tune is successful for most valves. However, very large actuators or high hysteresis may require manual tuning.

WARNING

This procedure moves the valve.
This results in loss of process control.

To run autotune:

1. Ensure that you are in *Setup* mode.
2. Set the Actuator Size to Custom Tuning.
3. Click the **Auto Tune** radio button.
4. Set the *Aggressiveness* as required.
5. Click Start Auto Tune and the tune starts.
6. Once complete the *Results & Log* appears (Figure 57).

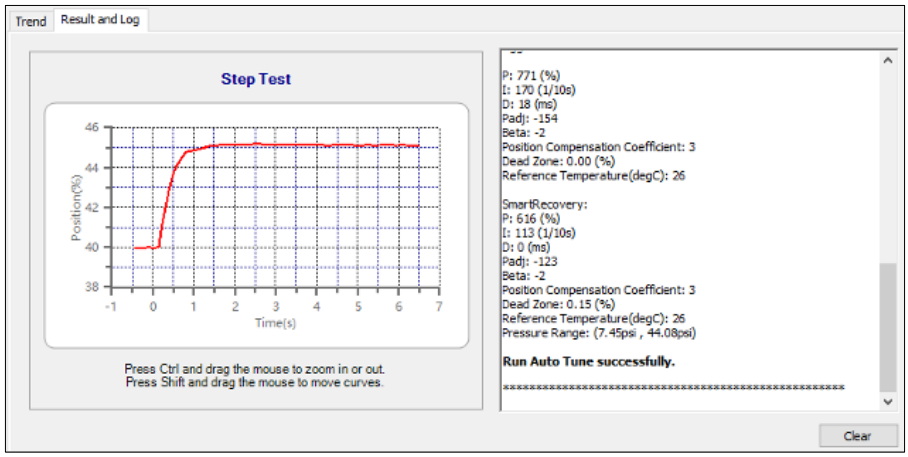


Figure 57 Auto Tune Success

8.13.2 Manual Tune

Manual tuning is enabled when device is Setup or Manual mode. When Manual tuning is selected, Tuning Parameters become active.The Manual Tuning on this Tab applies to Position Control only.

Click  and the DTM saves all tuning parameters to the device. The existing device tuning parameters are stored as previous tuning parameters. Click the **Restore PID Baseline** button to reset tuning parameter to previously stored parameters.

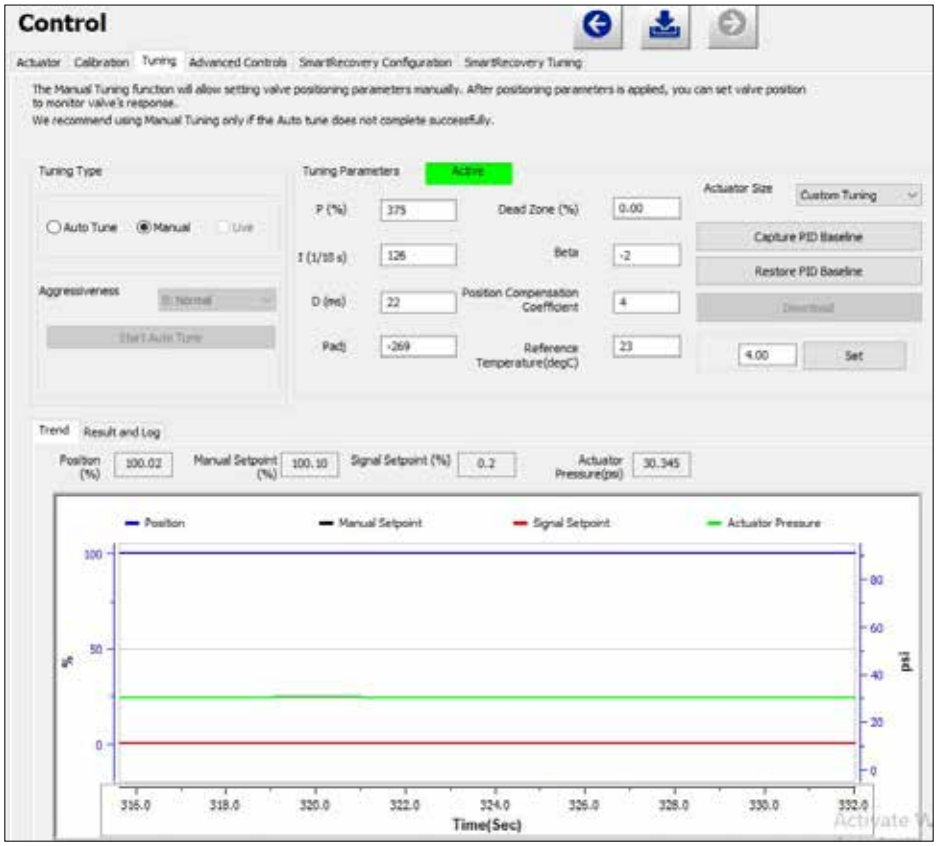


Figure 58 Manual Tune

To run manual tune:

1. Ensure that you are in *Manual* or *Setup* mode.
2. Click the **Manual** radio button.
3. Set the Actuator size to other than Custom Tuning. For *Tuning Parameters* and Actuator size details, refer Buttons and Fields in Section 8.13 “Advanced Setup: Control: Tuning”.
4. Click **Download** button.
5. Once complete the *Results & Log* appears (Figure 57).

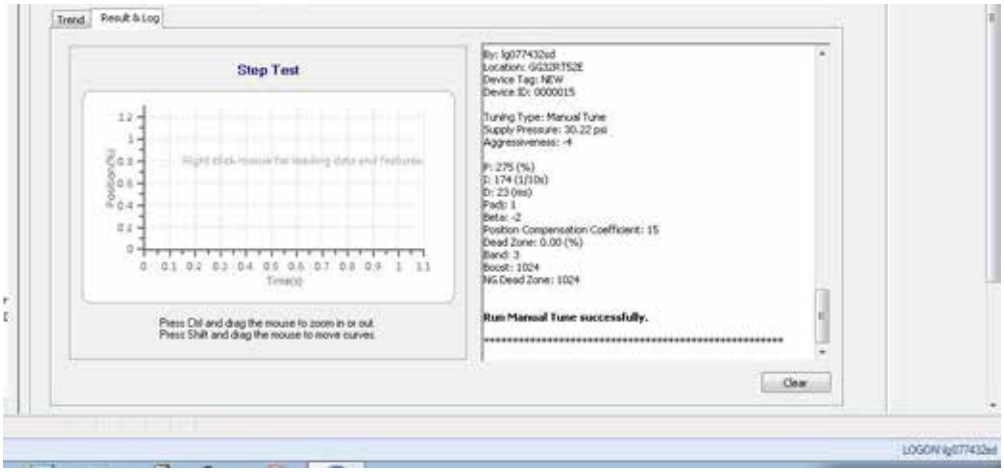


Figure 59 Manual Tune Success

8.13.3 Live Tuning

In Normal mode, experienced users can tune PID parameters live. *Only experienced users should use this feature.* Live tuning involves only *P*, *I*, *D* and *Padj* and only these selections are active. This feature applies to Position Control only.

To avoid process disturbance, this dialog limits the change in each parameter to ±20% of the original value.

To do this:

1. Click the **Live** radio button and Figure 60 appears.

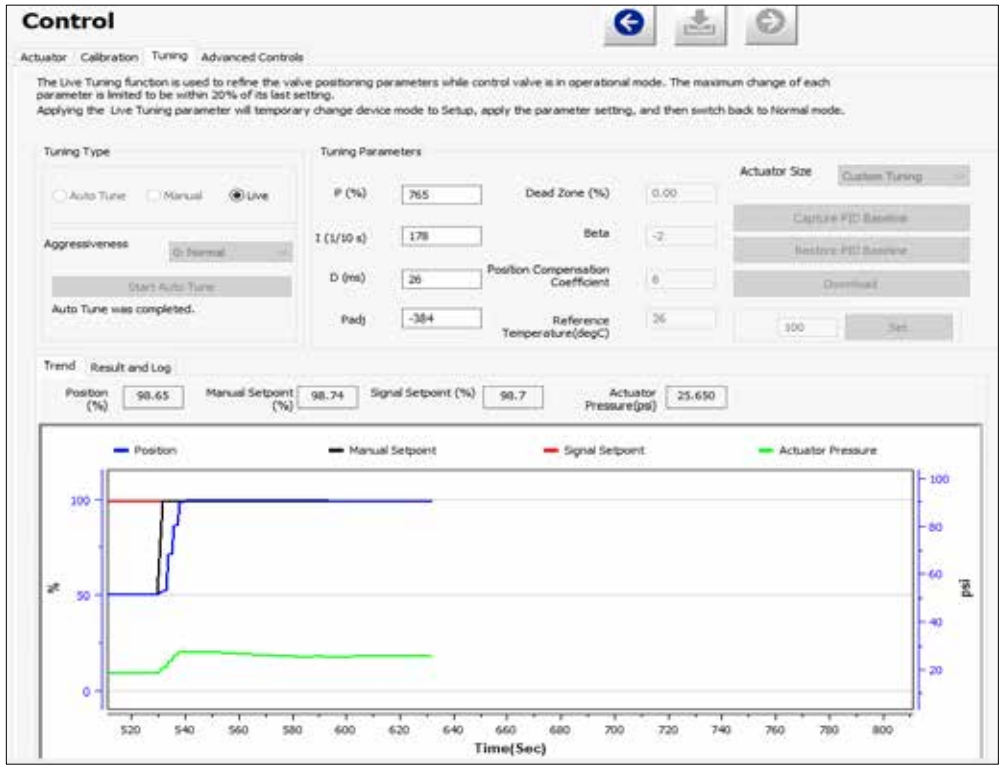


Figure 60 Live Tuning Selected

2. Configure the desired parameters to study the behavior.

8.14 Advanced Setup: Control: Advanced Controls

Use the *Advanced Controls* screen to configure the parameters related to valve characterization, tight shutoff full open above, position rate limits and bumpless transfer.

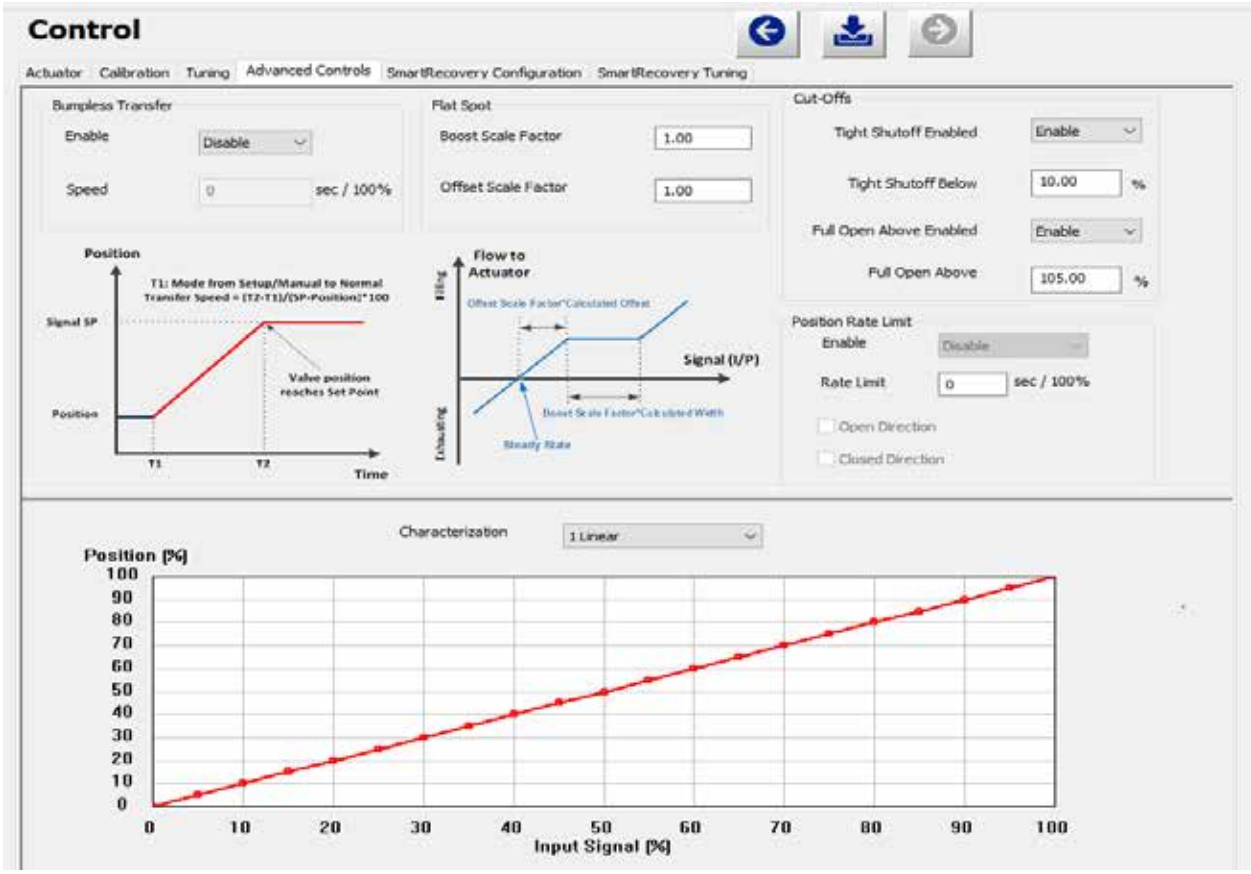


Figure 61 Advanced Setup: Control: Advanced Controls

Buttons and Fields

Bumpless Transfer

Use the pulldown list to select/deselect this option.

This option provides a means to maintain smooth valve control positioning when the device mode from Manual/Setup to Normal. Without Bumpless Transfer, the setpoint could vary in a manner that causes a significant process disturbance. *Bumpless Transfer* moves the controller signal to match the valve position so that smooth resumption of control with little disturbance results.

When *Bumpless Transfer* is selected, returning to Normal mode from Manual or Setup mode is deferred until the input signal matches the current valve position. Either the input signal or the valve position can be changed to match. If nothing is done, the system slowly changes the position until it matches the signal set-point. The time taken to move to the position is determined by the *Speed* which is a number between 0 and 255 and is approximately the number of seconds required to move the valve 100% toward the signal position.

Flat Spot

This field is designed to be used only during the initial installation and characterization process for a valve/actuator. **Only highly-qualified engineers should use these settings. Estimations for the values used in these fields require this expertise and are based on each specific install.**

The flat spot is a non-linear pneumatic relay behavior that causes a negative effect on dynamic control performance. There is an internal physical model in SVI3, which is used to calculate the flat spaot width and offset real time. The flat spot width is related to real time actuator pressure and supply pressure data as well as mechanical and electronic components data. The flat spot offset is also correlated to both actuator and supply pressures as well as air fluid thermodynamics, mechanical and electronic components data.

Boost Scale Factor- It is a multiplier used to modify the calculated flat spot width. The default value is 1.0. The valid range of the value is between 0 and 2.0.

Offset Scale Factor- It is a multiplier used to modify the calculated flat spot offset. The default value is 1.0. The valid range of the value is between 0 and 2.0.

The modified flat spot width and offset are used in SVI3 flat spot compensation, which improves dynamic control performance.

The default values should be used for Boost Scale Factor and Offset Scale Factor for most installation. Using a value larger than 1 for Boost Scale Factor will increase the compensation and boost air filling. Excessive compensation may lead to local oscillation especially for small actuators. On the other hand, insufficient compensation causes slower responses near the target area. For a positioner without air supply pressure sensor or damaged sensor, the boost scale factor may be adjusted to the actual supply pressure in psig divided by 20. For supply pressure greater than 40 psig, use 2.0 for Boost Scale Factor. Using a value larger than 1 for Offset Scale Factor will increase the flat spot offset value and reduce the chances for boosting air filling.

Tight Shutoff

Enable Tight Shutoff	Use this pulldown to enable/disable the use of *Tight Shutoff*'s value. Activates a tight shutoff below the value in the field.
Tight Shutoff field	Enter a percentage. For ATO, full spring force is utilized to fully seat the valve if the input signal would position the valve below the tight shutoff value. For ATC, full supply pressure is utilized to fully seat the valve if the input signal would position the valve below the tight shutoff value. Range: -1 to 20%.
Enable Full Open Above	Use this pulldown to enable/disable the use of Full Open Above's value. Activates a full open above the value in the field.
Full Open Above field	Enter a percentage. For ATO, full supply pressure is utilized to fully open the valve if the input signal would position the valve above the Full Open Above value. For ATC, full spring force is utilized to fully seat the valve if the input signal would position the valve above the Full Open Above value. Range: 80% – 105%.
Position Rate Limit	Click the associated radio button to configure whether the position rate limit applies to: • Both Directions • Open Direction • Closed Direction See Section 8.14.1 "Configure Position Rate Limit".
Rate Limit	Enter a time to limit the rate of change for travel (sec/100% of travel). This prevents the valve from slamming open or shut.

Characterization Use the pulldown list to select the characterization type.

Control valves are *characterized* to give a specific relationship between valve position and input signal. The valve can be characterized with special purpose trim or with the SVI3 positioner. Several characterizations are available:

- Linear: Linear is default characterization type, it causes the valve to open proportionally with the input signal.
- Equal % (50) and Equal % (30) & Camflex: Three characterizations are available, first with R=50, second with R=30 & third with Linear and R=50. For instance, the positioner will adjust output to force less of an opening of the valve in the region when moving off the seat, and more of an opening of the valve in the region when moving towards full open.
- Quick Open: The quick opening characterization is the inverse to the Equal
- Percentage 50% characterization curve. For instance, the positioner will adjust output to force more of an opening of the valve in the region when moving off the seat, and less of an opening of the valve in the region when moving towards full open.
- Custom: Selecting this option displays a Custom Data field showing the default custom data points and an Edit button to access an additional dialog where you can enter or draw a custom characterization curve. The curve can have up to nine points and points in between are linearly interpolated. Figure 62 shows the characterization curves in a graphical format.

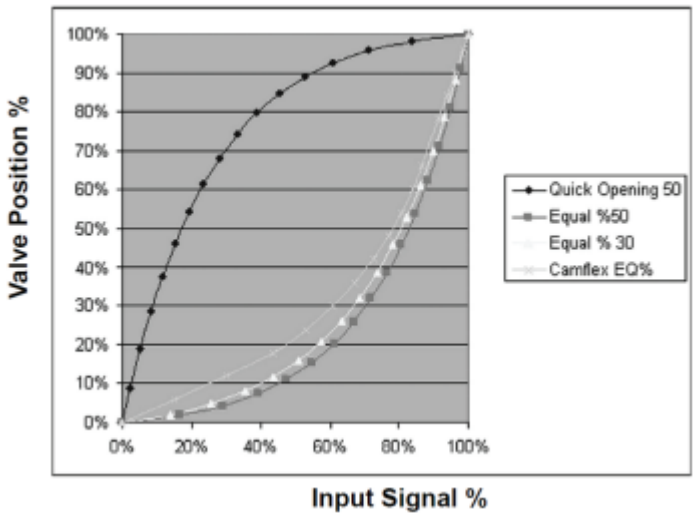


Figure 62 Characterization Curves

Custom Characterization

Custom characterization is accomplished using the bottom portion of the *Advanced Control* screen (Figure 63). See Section 8.14.2 “Create a Custom Characterization”.

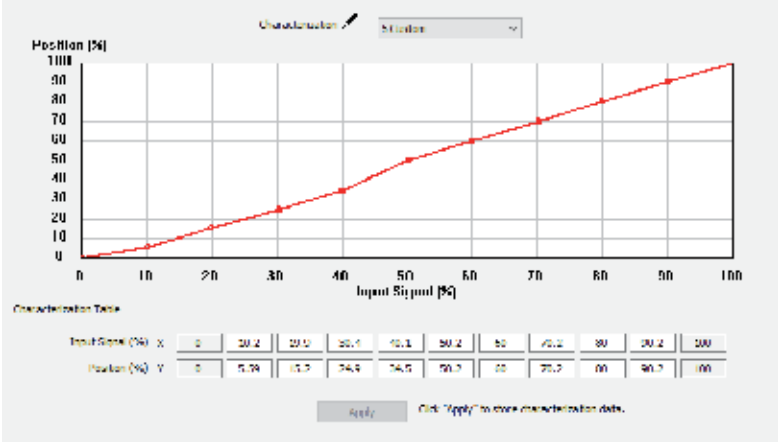


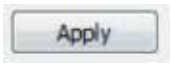
Figure 63 Custom Characterization

Relative Travel/ Relative Setpoint Coefficient

Activated by selecting *Custom* in *Characterization*.

A custom characterization defines the relationship between the input signal and the output position of the valve.

The characterization may contain up to nine XY pairs and the position is linearly interpolated between the pairs. The first position is always 0, 0 and the last position is always 100, 100. Both first and last positions indicate 0 and 100 percent and are not counted as any of the nine points allowed. See Section 8.14.2 “Create a Custom Characterization”.



Apply button

Click to store the *Custom Characterization* data to the positioner.

8.14.1 Configure Position Rate Limit

1. Select the radio button dissociated with the correct function.
2. Enter the *Rate Limit*.
3. Click  to download to the device.

8.14.2 Create a Custom Characterization

A custom characterization defines the relationship between the input signal and the output position of the valve. The characterization may contain up to nine XY pairs and the position is linearly interpolated between the pairs. The first position must be *0, 0* and the last position must be *100,100*. Both first and last positions indicate *0* and *100* percent and are not counted as any of the nine points allowed. To create a custom characterization:

1. Use the *Characterization* pulldown to select **Custom** and the *Edit* button appears.
2. Click **Edit** and Figure 64 appears on the bottom of the screen, along with the *Custom Data* field on the *Options* tab. The *Custom Data* field displays the data points once configuration is complete.

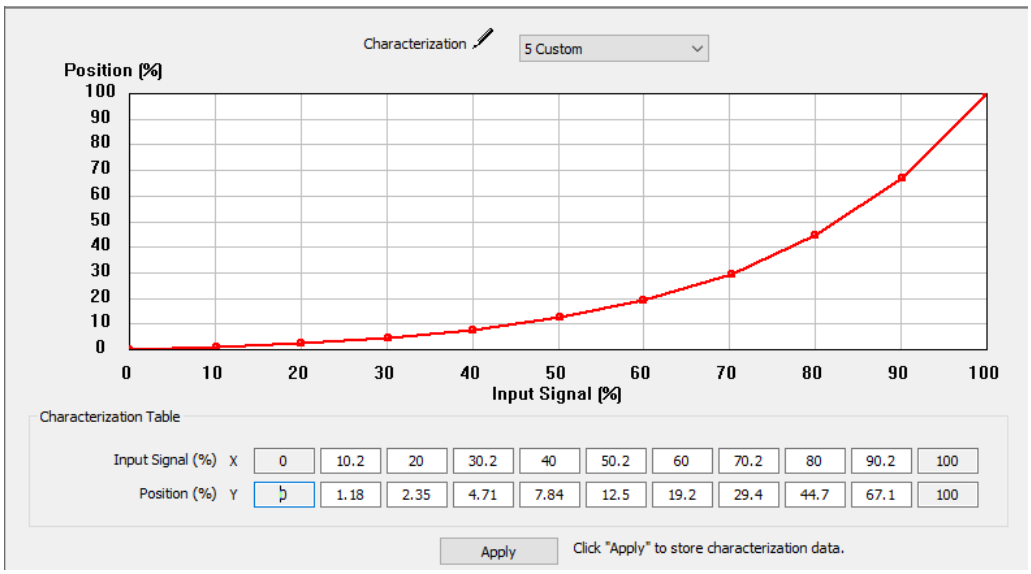


Figure 64 Custom Characterization

Input Signal and *Valve Position* fields activate.

3. Enter values in the *Input Signal* and *Valve Position* fields from lowest to highest. If there is too drastic a slope change a dialog appears (Figure 65). Adjust values accordingly.

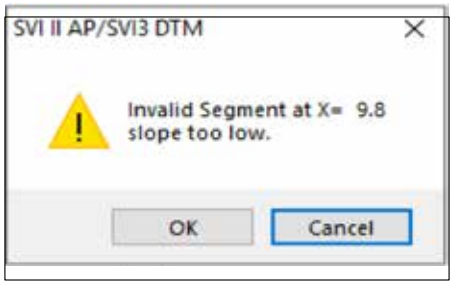


Figure 65 Invalid Segment Dialog

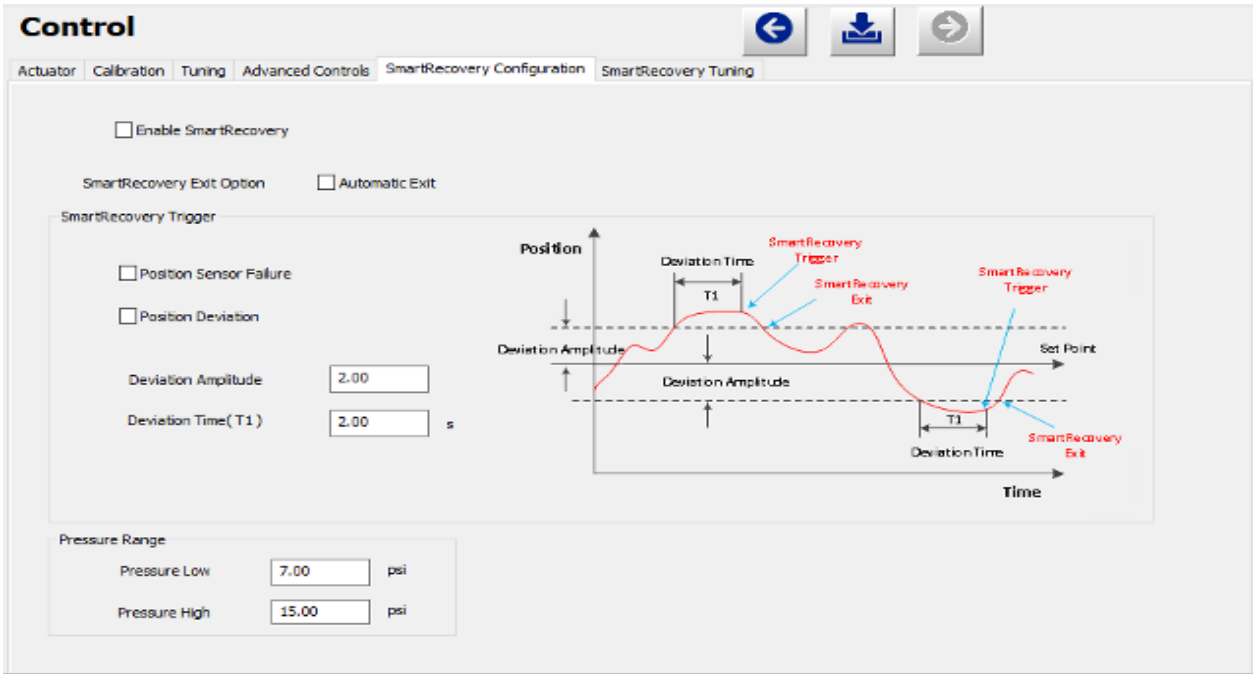
A dialog appears prompting you to save.

4. Click **OK**.

8.15 Advanced Setup: Control: SmartRecovery Configuration

Use the SmartRecovery Configuration screen to configure the parameters related to SmartRecovery mode. The parameters include Enable SmartRecovery, SmartRecovery Exit Option, SmartRecovery Trigger and Pressure Range.

Note: User can see this screen only when the diagnostic level of the positioner is above Standard Diagnostics and the SVI3 device revision is 2 or higher. SVI3 positioner cannot provide SmartRecovery features if the diagnostic level is Standard Diagnostics.



Buttons and Fields

Enable SmartRecovery

Use this check box to turn on SVI3 SmartRecovery feature.

SmartRecovery Trigger

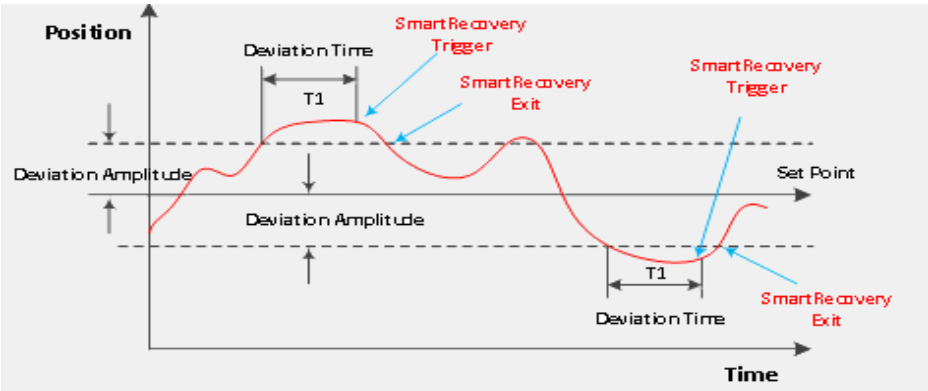
Position Sensor Failure

SVI3 positioner may enter SmartRecovery mode when Positioner Sensor Failure occurs if the Trigger “Positioner Sensor Failure” is turn on

Position Deviation

When Positioner Deviation/Time exceeds the minimum value that user configured, SVI3 positioner may enter SmartRecovery Control mode if the Trigger “Positioner Deviation” is turn on

- Deviation Amplitude: Use this field to configure the minimum position deviation that may trigger SmartRecovery Control
- Deviation Time: Use this field to configure the minimum deviation time that may trigger SmartRecovery Control



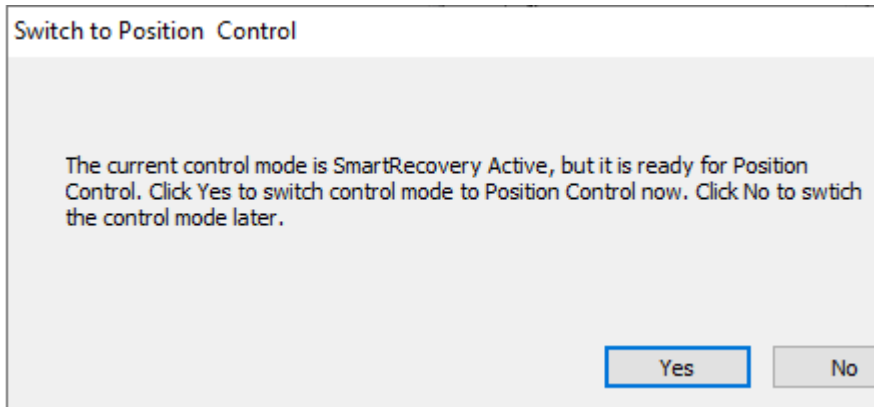
SmartRecovery Exit Option

Exit Option is configured as Automatic:

If SmartRecovery triggering condition is cleared, SVI3 will automatically return to Position Control mode from SmartRecovery mode without user’s confirmation.

Exit Option is not configured as Automatic:

If SmartRecovery triggering condition is cleared, the SVI3 is ready to run in position control mode, but user’s action is required to switch control mode.



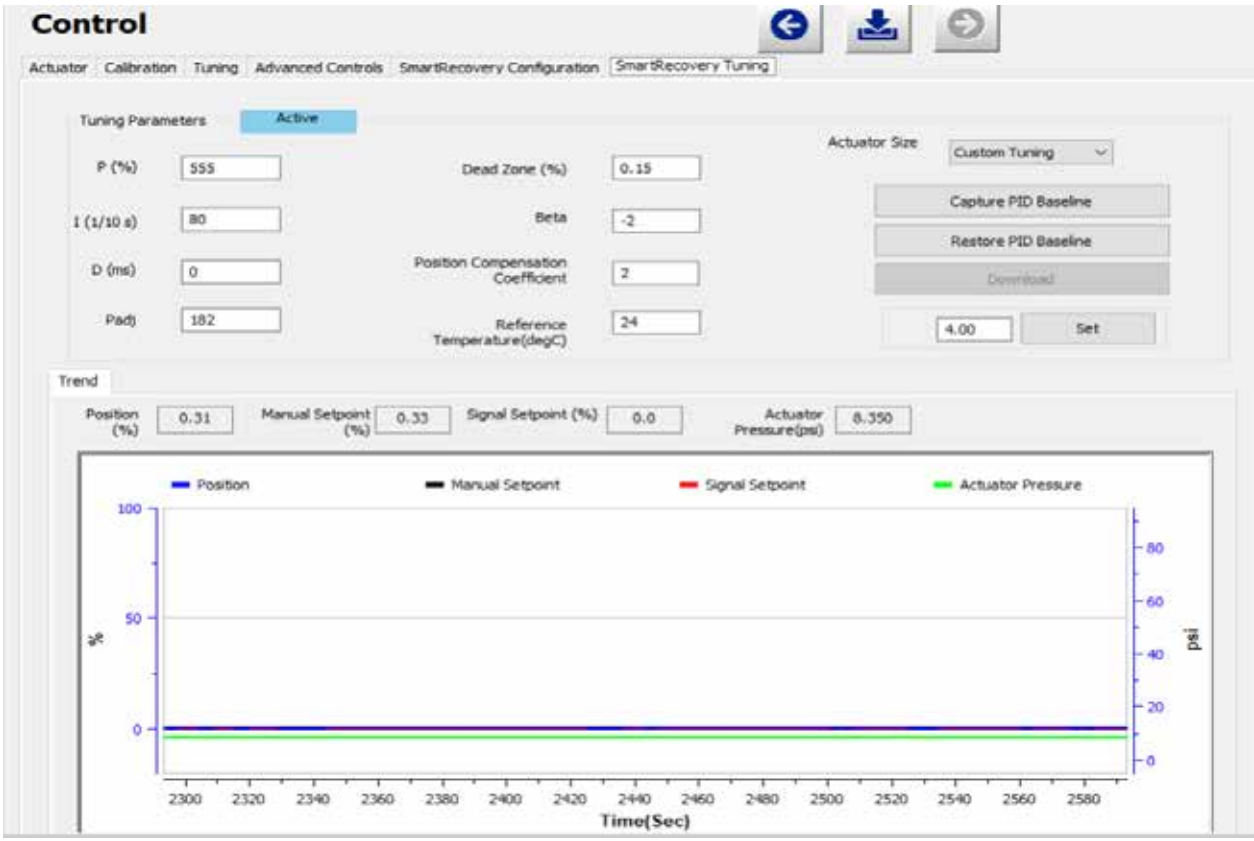
Pressure Range

Pressure Low and Pressure High are used for controlling valve when device is running at SmartRecovery mode. For ATO, the (Pressure Low, Pressure High) is mapped to position (0%, 100%). For ATC, pressure range is mapped to (100%, 0%).

The pressure Range is calculated automatically when running Auto Tune. User can configure the values manually but it is not recommended.

8.16 Advanced Setup: Control: SmartRecovery Tuning

User can see SmartRecovery Tuning screen after SmartRecovery is enabled. Use this screen to configure Tuning parameters that are used in SmartRecovery Control mode and view the results of tuning parameters on the Trend display. Please note: these control parameters are not used when device is running at position control mode.



Buttons and Fields

P	Proportional gain in %. Common values for the positioner are 0 for small valves up to 4000 for large valves.
I	Integral time or reset time in 1/10th sec, is the time constant of integral control. Higher values of I cause less integral action. *0* gives no integral action. Common values are 10 to 200.
D	Derivative time or rate time (msec) is the time constant of derivative control. Common values are 10 to 100.
Padj	Valves often have significantly different response when filling verses exhausting. The proportional gain is adjusted by adding *Padj* (%) to *P* when the valve is exhausting.
Dead Zone	When the valve position is within the setpoint +/- the dead zone, no additional position control is performed. This value is normally 0%, however for high friction valves (e.g. valves with graphite packing) a higher dead zone (%) helps avoid limit cycling due to the stick/slip action of the valve. In these cases the dead zone chosen might be 0.5% to 1%. Range: 0 to 5%.
Beta	This is a nonlinear gain factor, ranging from -9 to 9. When Beta is 0, the controller gain is linear. Otherwise, the gain is the function of error. The larger the beta, the smaller the gain for small error.
Position Compensation	The response of the valve is different when the valve is nearly closed than when the valve is nearly open. The position compensation coefficient, which is a number between 0 and 20, make adjustments to try to equalize the valve response. The normal value is 6. For springless actuators the value is 15.
Reference Temperature	Refers to the temperature at which the control parameters were tuned. For example, if current temperature is 40°C when you successfully run autotune, the reference temperature is 40.

9. Diagnostics

9.1 Diagnostics

Use the *Diagnostics* screen to perform a device reboot of the SVI3.

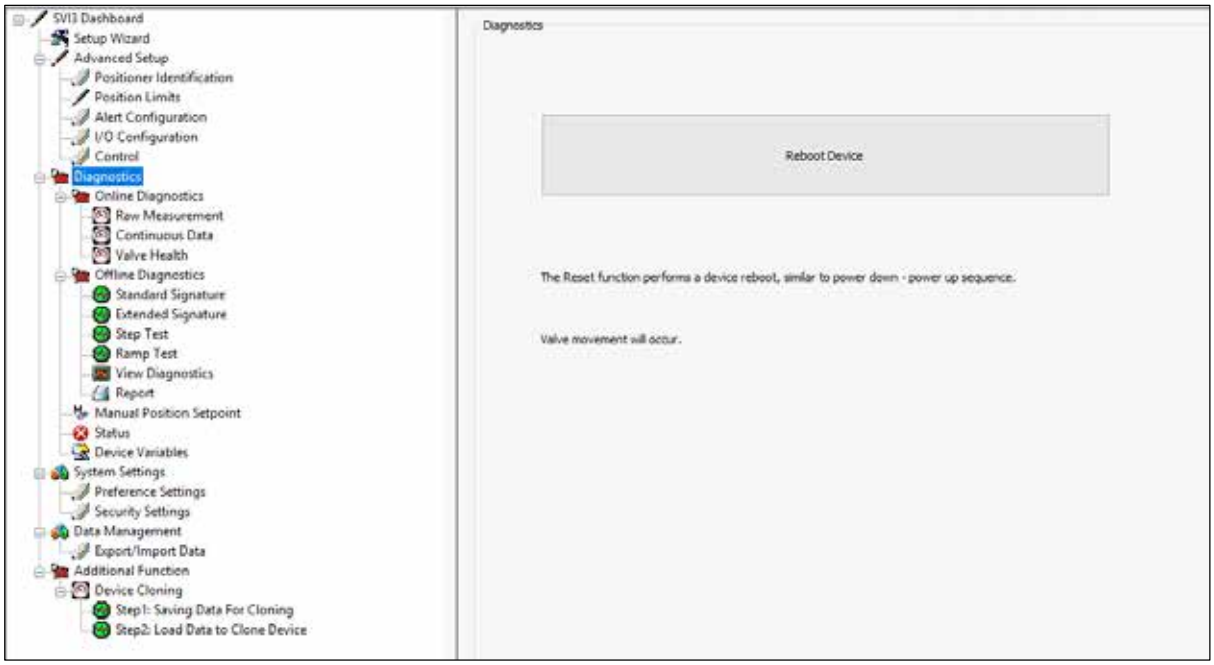


Figure 66 Diagnostics Screen

Buttons and Fields

Reboot Device *Reboot Device* button	Click this to reset the SVI3.

9.2 Diagnostics: Online Diagnostics: Raw Measurement

Use this screen to view the raw counts of status of signals, pressure, temperatures and I/Os. Additionally, you can *Set I/P to* drive the I/P signal for troubleshooting. The current continuous diagnostics information and is updated every time the screen is selected. This screen is used primarily for troubleshooting. To Set I/P or Unsetp I/P on the *Raw Measurement* screen you must be in the Setup mode.

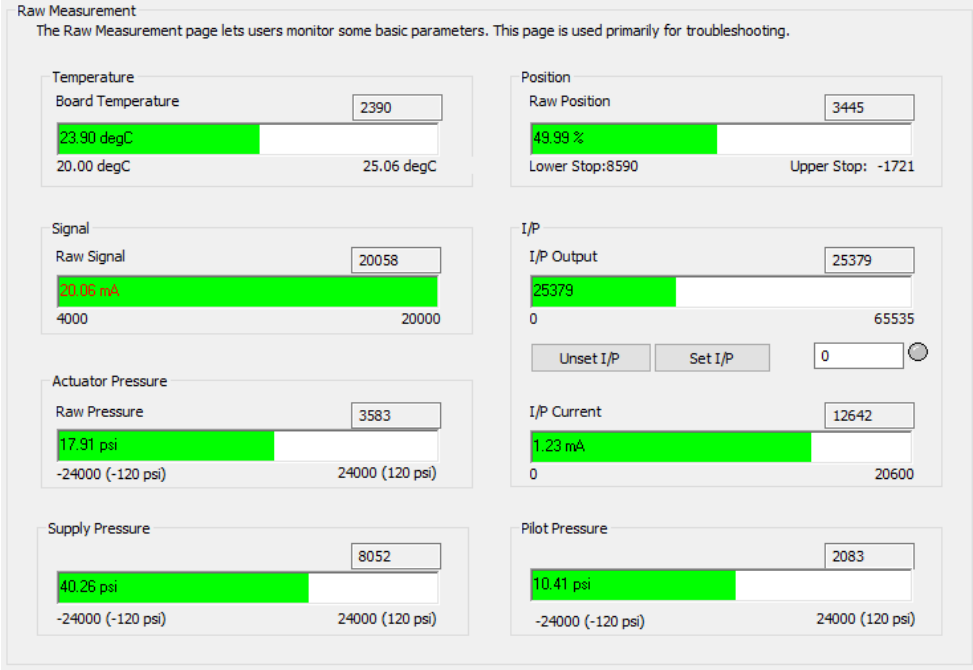


Figure 67 Diagnostics: Online Diagnostics: Raw Data Screen

Buttons and Fields

Temperature

Board Temperature — Displays the actual circuit board temperature in degrees as a bar graph and as counts in a text box. Value in the bar graph is the current value as measured by SVI3. Left value is the minimum measured temperature ever recorded by the SVI3 and right value is the maximum measured temperature ever recorded by the SVI3.

Signal

Raw Signal — Displays the input signal strength in counts as a bar graph and as counts in a text box.

Actuator Pressure

Raw Pressure — Displays the raw A/D values for pressure, which is useful to Baker Hughes engineers for diagnostic purposes. Displays the data strength in counts in a text box and as in a bar graph in the user-configured pressure units.

Supply Pressure — Displays the raw A/D values for supply pressure, which is useful to Baker Hughes engineers for diagnostic purposes. Displays the data strength in counts in a text box and as in a bar graph in the user-configured pressure units.

Pilot Pressure — Displays the raw A/D values for pilot pressure, which is useful to Baker Hughes engineers for diagnostic purposes. Displays the data strength in counts in a text box and as in a bar graph in the user-configured pressure units

Position

Raw Position	Displays the raw A/D values for position, which is useful to Baker Hughes engineers for diagnostic purposes. Displays the data strength in counts in a text box and as in a bar graph as a percentage of open.
Lower Stop	Displays the position raw counts at the stop.
Upper Stop	Displays the position raw counts at the stop.

I/P

I/P Output	Displays the I/P output in counts as a bar graph and in a text box.  Use this field and two buttons to enter and set the I/P output in counts and to unset the I/P value. This value is the constant signal to the I/P. A red exclama-tion point (**!**) appears if an input value is out of range. The indicator light to right indicates grey if unset and red when manually set.
I/P Current	Displays the I/P current in mA as a bar graph and as counts in a text box.

9.2.1 Set I/P

Setting the I/P removes the valve from normal control and sends a constant, user-defined signal to the I/P. This is useful for troubleshooting. This command is only available in Setup mode.

To set the I/P:

1. Enter a number between *500* and *65000* in the *Set I/P* edit box.
2. Click 

.

   A warning dialog appears (Figure 68).

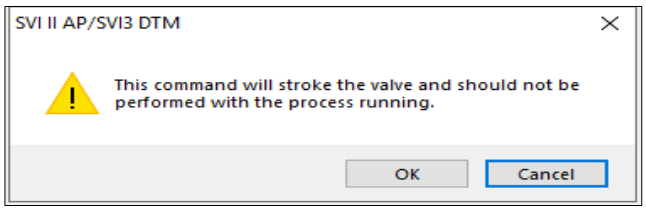
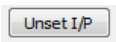


Figure 68 Set IP Warning Dialog

3. Click **OK**. The red indicator should appear. To resume normal control:

   Click 

9.3 Diagnostics: Online Diagnostics: Continuous Data

Use the *Continuous Data* screen to view data about valve operations at closing and opening, which useful in valve operation analysis.

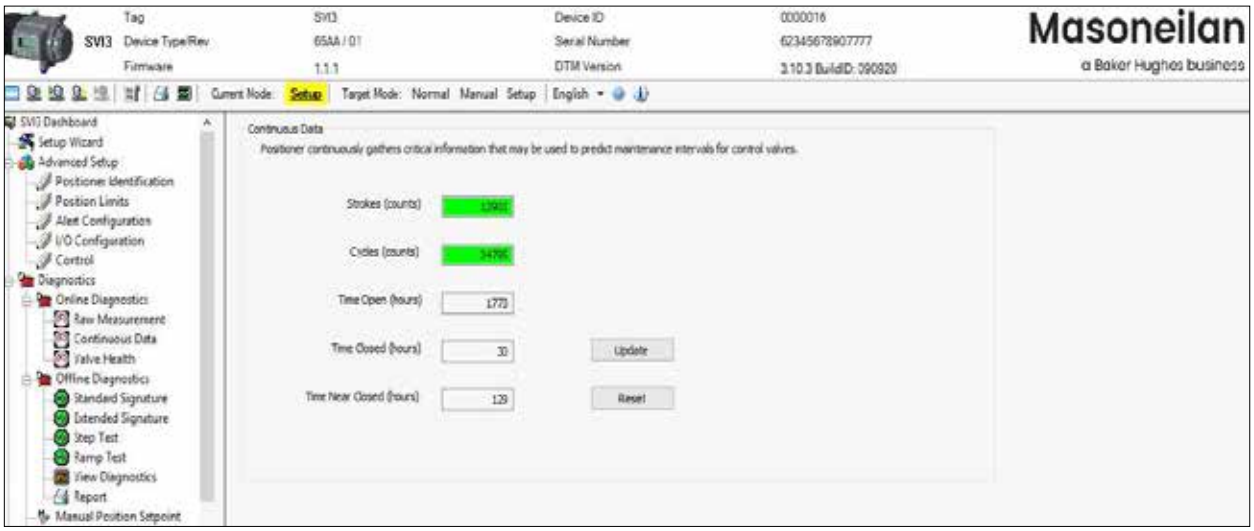


Figure 69 Diagnostics: Online Diagnostics: Continuous Data

Buttons and Fields

Strokes (counts)	Displays the total number of strokes (100% accumulated travel = 1 stroke).
Cycles (counts)	A count of the number of direction changes in the position of the valve.
Time Open (hr)	Displays the total open time of the valve in hours. Open means that the valve position is larger than half of relative noise level.
Time Closed (hours)	Displays the total closed time of the valve in hours. Closed means that the valve position is less than or equal to half of relative noise level.
Time Near Closed (hours)	A accumulated time when the position is less than the configured Near Close value.
Update *Update* button	Click this to read the screen values from the positioner.
Reset *Reset* button	Click this to reset all historian values to zero.

9.4 Diagnostics: Online Diagnostics: Valve Health

An exciting new feature of the SVI3 is the addition of Valve Heath Diagnostics. Also known as KPIs (Key Performance Indicators), these are online diagnostics, constantly calculated, without any impact to process control, supporting real time valve diagnostic analysis. The KPIs are calculated an average once per second, then averaged into 24 hourly, 7 daily, and 52 weekly records. With programmable alerts/limits for each KPI, users can be notified automatically when KPI data moves outside the allowable range. Using the Valve Health Online Diagnostics helps to identify valve or process issues well in advance of legacy diagnostic methodologies. The feature is enabled only when the SVI3 diagnostics level is Online Valve diagnostics. The SVI3 DTM is designed to support display Valve Health KPIs data currently saved in SVI3 device and historical trend of Valve health KPIs that are stored in the DTM local file.

Valve Health page

- Display all Valve Health KPIs values that is stored in the device through four Data Source Selections: *Current /Hourly/Daily/Weekly*. The DTM will filter duplicate and invalid KPI records.

  Note: When SVI3 is running in Smart Recovery control, device does not calculate Valve Health KPI. DTM will show all CURRENT KPIs as 0 and clear Pressure vs Position curve.

- Real-time trends display for user to observe position, pressure and setpoint
- Valve KPI displays in Green, Yellow or Red color that is based on the KPI alert active status
- Show Position vs Pressure curve
- Provide Refresh button to upload all available VALVE HEALTH data and save the data locally, and in ValVue3 database if applicable.

Figure 70 Valve KPI Results

Valve KPIs Limits setting

SVI3 DTM provide a user interface to enable valve health limit and set the value for the limit. When the VALVE HEALTH KPI reached the limit, the related alert will be triggered at Valve Health page and device status pages. Refer Section 8.4.3 “Valve Health Limits” if need to configure/enable valve KPI limits.

9.5 VALVE HEALTH Data management and KPI Historical Trend

An important feature to understand valve performance is to analyze the trends of historical data. The SVI3 stores up to 24 hourly, 7 daily, and 52 weekly data points. The Trend of each KPI can be useful to analyze performance over time, allowing for adjustments to be made to programmed limits, and for valve maintenance schedules to be created using factual, real time data.

KPI data within the device is saved within a circular buffer, meaning the oldest data is moved out when the buffer is full. For example, after the device has been running for 53 weeks, week 1 data will be removed, and only weeks 2through 53 will be available.

However, The DTM provides a useful database to store the trending data over time. For instance each time the DTM is synchronized with the SVI3, the data is appended to the DTM database. If data synchronization with the DTM occurs at a regular interval, no loss of data due to buffer filling will occur.

As an example, a user may want daily KPI records. The SVI3 will only provide the last 7 daily records. But if a user synchronized the device with the DTM every day, the DTM would build up a database containing all daily records ever read from that device.

VALVE HEALTH KPI data is loaded manually either through “Refresh” on Valve Health page or “Sync with Device” on Historical Trend page. When DTM loads VALVE HEALTH KPI data from device, the data will be stored into local devdata file to support displaying hourly, daily and weekly KPIs trending, with adding timestamps.

Trend display types mainly provides the following aspects. User can switch the display data through right-click menu on the Trend.

- Friction
- Lower Spring Range
- Upper Spring Range
- Stick Slip Ratio
- Stick Slip Amplitude
- Position Cycling Rate
- Position Cycling Amplitude
- Setpoint Cycling Rate
- Setpoint Cycling Amplitude
- RMS Error
- Offset Error

- Tight Shutoff Rate
- Tight Shutoff Count
- Obstruction Position
- Calibration Error

User can check on Cross Line to read the VALVE HEALTH KPI value, check on Display As Points to display data as point, check on Show Limits to display VALVE HEALTH limits on the trend and view the comments if there are comments saved during the period the user selects.

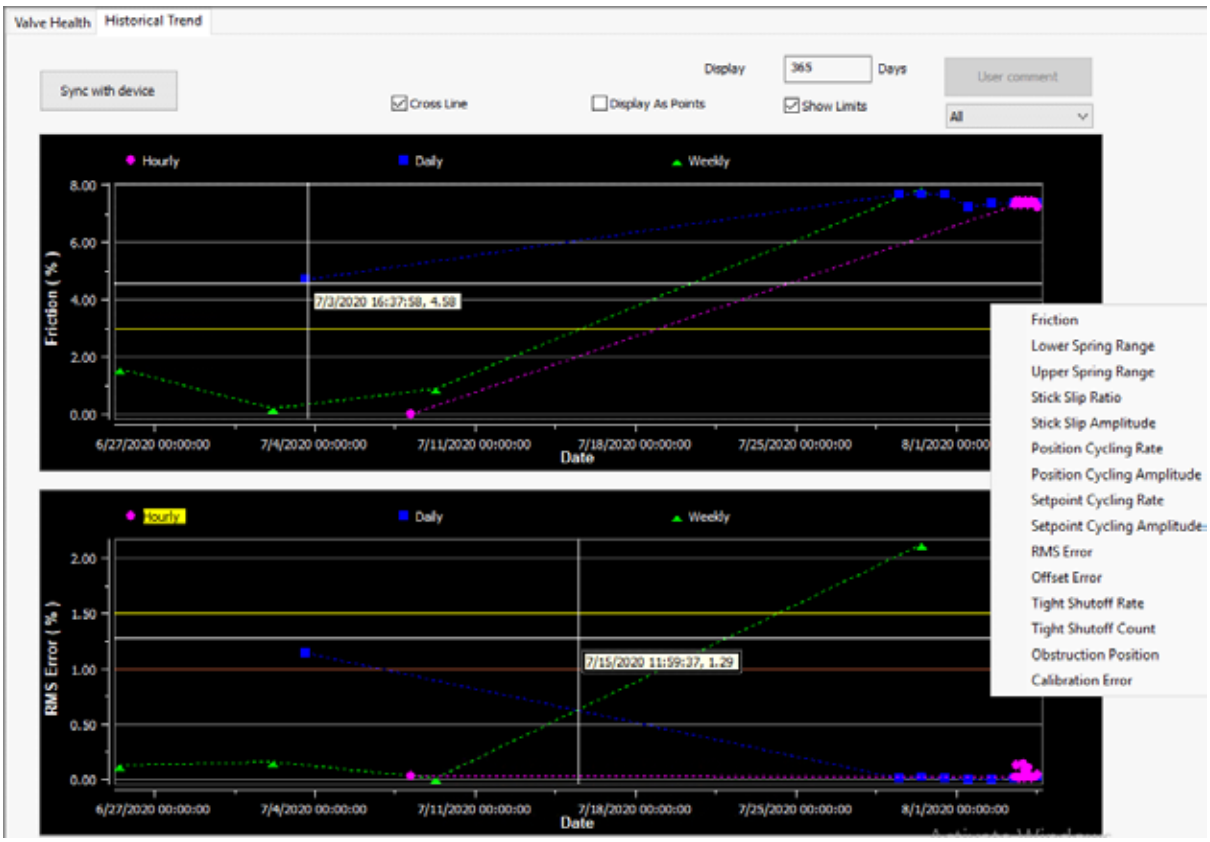


Figure 71 Historical Trend

9.6 Diagnostics: Offline Diagnostics

SVI3 DTM allows four diagnostic tests to be performed (Standard Signature, Extended Signature, Step and Ramp tests) and displays test results in the Trend and Results & Log windows. There is also in SVI3 DTM, a View results screen for performing comparison and analysis of tests (present and historical). Additionally, valve parameters including, Position and Actuator Pressure appear for reference (Manual Setpoint for Ramp Test). These tests are run with the valve/positioner connected but the system not in the control loop.

Refer Table 1 to see what is available based on DTM license level and device diagnostic level.

Refer Section 13.2 “Additional Functions: DTM Licensing” to check whether you have SVI3 DTM licensed to provide advanced diagnostics capability and a SVI3 unit with advanced diagnostics level or greater.

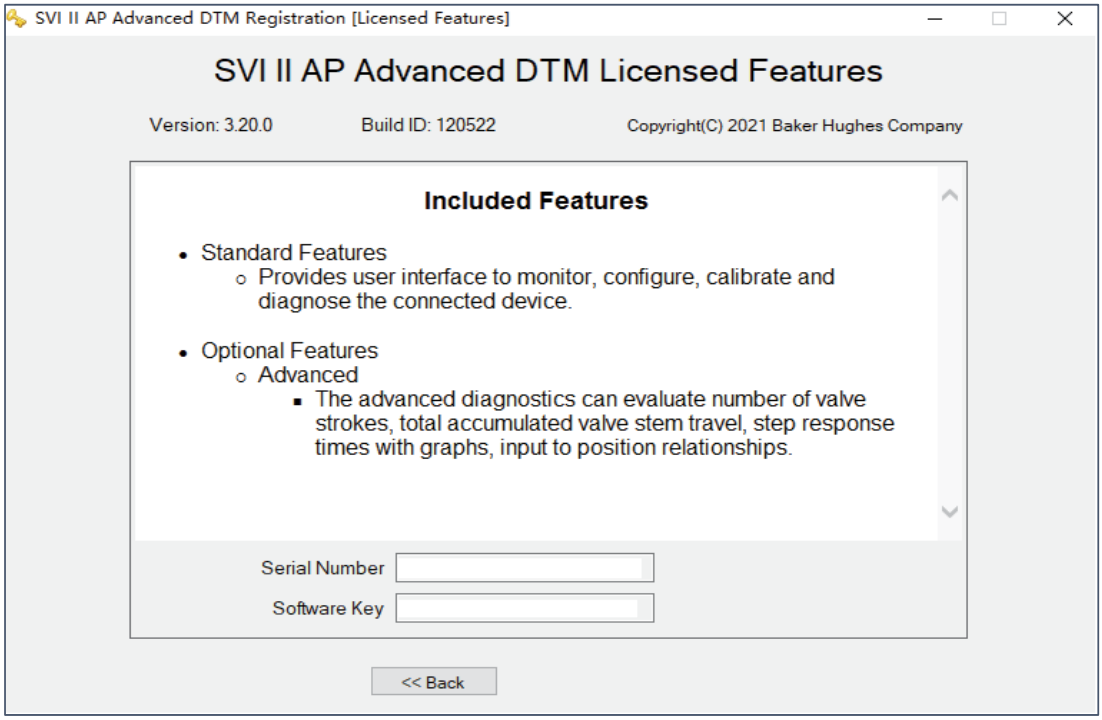


Figure 72 Licensed Features

Refer Table 1 to see the available options of diagnostics.

9.7 Diagnostics: Offline Diagnostics: Standard Signature

Use this tab to perform a *Standard Signature* test. The *Standard Signature* test goes from 10% to 90% measures the friction, spring range and response time.

During the *Standard Signature* test the positioner is slowly moved from the starting position to the ending position and back and the two curves (up and down) are measured and displayed in the *Trend* and the *Signature Results* graphs.

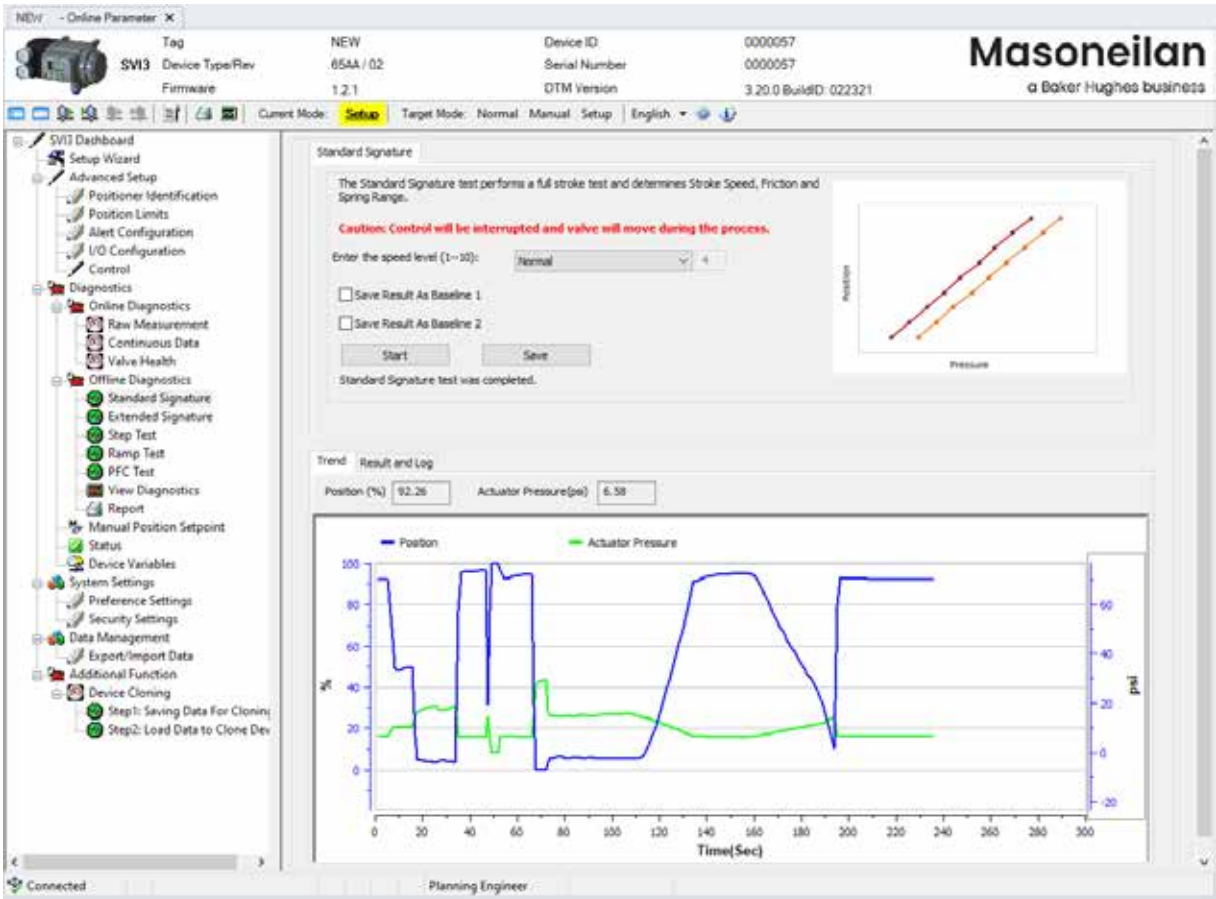


Figure 73 Diagnostic: Offline Diagnostics: Standard Signature

Buttons and Fields

Standard Signature

Static graph	The graph is the upper right-hand corner is a static representation of the test type selected.
Enter the Speed Level	The speed level is the rate of speed at which the valve is moved as the test is performed, *1* is the slowest and *10* the fastest. The default speed level is *4*. This field can be adjusted to account for larger (larger actuator area involved) or smaller valves (smaller actuator area involved).

Save Results as Baseline 1 / Save Results as Baseline 2

Click after the test is run and the results are saved as a baseline curve within the SVI3 device to which you can compare other curves. The baseline curve rep-resents the best example of proper valve/positioner function. Saving a new baseline, either 1 or 2, overwrites an older one.

Start button

Click to commence the test. This button changes to a *Cancel* button. Click the *Signature Results* tab to see data once the test completes.

Trend

Above the graph appear the presently detected values for the items shown on the graph. The graph displays these curves by color as:

- *Position* - blue line on the graph vs. Time. Displays the position of the valve is in percentage of valve opening at the top of the graph. 0% is always closed and 100% is open. Because the travel of a valve may exceed its nominal travel, positions greater than 100% are possible.
- *Actuator Pressure* - green on the graph vs. Time. Displays the pressure read by the sensor at the top of the graph.

Zoom the graph by right-clicking in the graph and dragging an area.

Unzoom by right-clicking in the graph.

Drag the graph by left-clicking, holding and moving the graph.

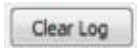
See “Results and Log Right-Click Menu” under Section 9.7 “Diagnostics: Offline Diagnostics: Standard Signature” for an explanation of graph functionality.

Results & Log

Displays the latest completed result: *Position* vs *Pressure* as a plot and the log of events to the right.

Click **Add Comment** 

to open the *Comment* dialog to add related notes. See Table 2 for an explanation of functionality.

Click **Clear Log** 

to clear the log space.

See “Results and Log Right-Click Menu” under 9.7 “Diagnostics: Offline Diagnostics: Standard Signature” for an explanation of graph right-click menu.

Results and Log Right-Click Menu

Table 4 lists the right-click items and describes their functionality.

Table 4 Results and Log Right-click Menus

Item	Description
Print Graph	Prints the graphs to the default printer.
Scales Setup	Opens this dialog to upper and lower ranges for the scale for each graph. The test type dictates what range is available based on whether it is for pressure, time, etc.
Show Legend	Adds a legend for the curves based on the test type and how many individual tests are represented.
Show Data Points	Adds data points to each test result for a graph.
Show Setpoints	Adds setpoints to the display for a *Step Test* only.
Grid Line	Adds or formats each graph grid line. Choices are: *Solid*, *Dot* or *None*.
Result Analysis	Opens the *Result Analysis* dialog. This dialog has content based on the test type (Figure 74).

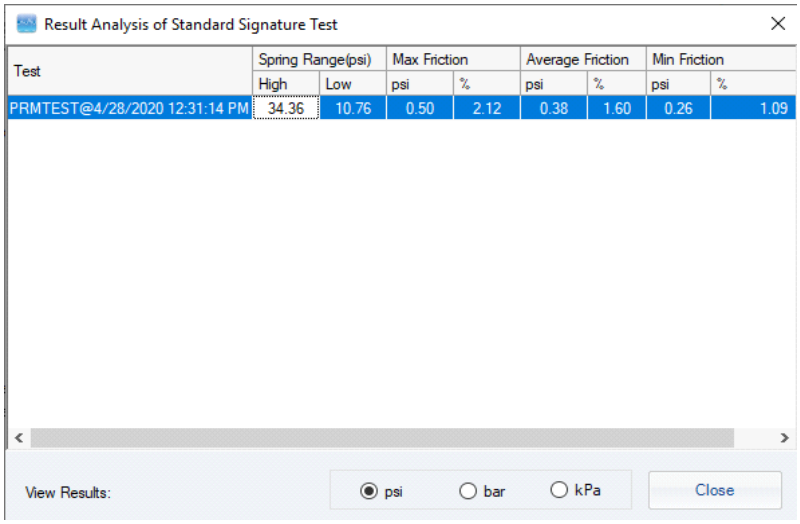


Figure 74 Results Analysis

Table 4 Results and Log Right-click Menus (Continued)

Item	Description
Load Data From	Use the popup menu to select: • *Save Result* as Baseline 1: Loads the last performed test of the same type that was saved as a baseline. If there was no baseline test saved it is inactive. • *Save Result* as Baseline 2: Loads the second to last performed test of the same type that was saved as a baseline. If there was no baseline test saved it is inactive. • *Last Run*: Loads the last saved test of the same type. If there was no saved test it is inactive • *Internal Data*: Opens a Load Test dialog that lists all tests that have been performed (stored in the database) and you can load one for comparison. • *External File*: Opens an Open dialog that lists all tests that have been performed and saved so you can load one for comparison. Once you select a test, you then get the Load Test dialog to choose the particular test (s) you want from the file. The files types supported are .devdata, .DDF and .dgn. The functionality of this selection is useful for analyzing ongoing valve performance to note any performance degradation.
Hide This Graph	Hides the selected graph. Once hidden you can retrieve the graph using the *View* menu.
Show This Graph Only	Leaves only the selected graph displayed.
Zoom Out	This item is activated once you change the graph scale in the graph setup.
Remove Selected Curve	Removes the selected curve from the graph.
Export to Excel	Opens a *Save As* dialog to export the data for the displayed items to an .xls file.

9.7.1 Perform a Standard Signature Test

To perform this test:

WARNING

This procedure moves the valve.
This results in loss of process control.

1. Ensure the system is in Setup mode.
2. Click **Standard Signature** tab and enter the *Speed Level* (Figure 73).
3. Enter a *Speed Level*, click Start to run test.

   Test Log and test result curve appears after the test finished (Figure 75).

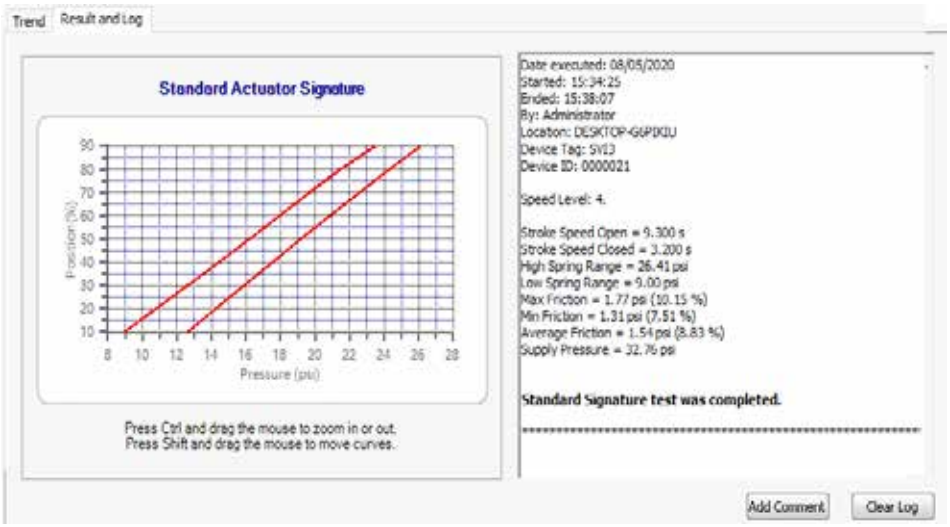


Figure 75 Diagnostics Standard Act. Sig. Test Results

9.8 Diagnostics: Offline Diagnostics: Extended Signature

Use this tab to run the *Extended Signature Test*, which slowly ramps the pressure to the actuator up and down over a user selected position range and measures the position vs. pressure. The signature is useful for determining valve friction and for identifying performance problems at specific valve positions.

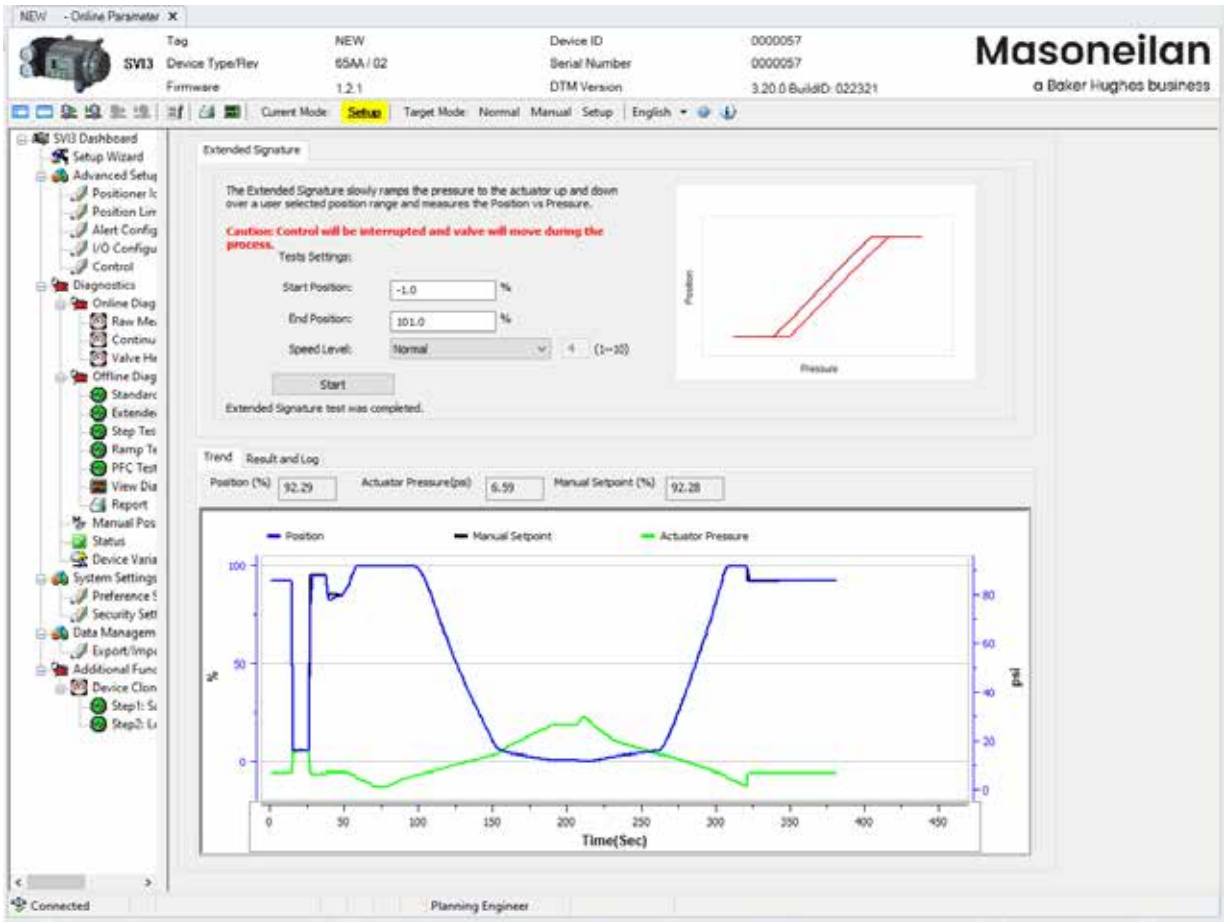


Figure 76 Diagnostic: Offline Diagnostics: Extended Signature

Buttons and Fields

Extended Signature

Static graph	The graph is the upper right-hand corner is a static representation of the test type selected.
Speed Level	The speed level is the rate of speed at which the valve is moved as the test is performed, *1* is the slowest and *10* the fastest. The default speed level is *4*. This field can be adjusted to account for larger (larger actuator area involved) or smaller valves (smaller actuator area involved).
Start Position (%)	Enter the start position for the step test as percentage of valve open.

End Position (%) Enter the stop position for the step test as percentage of valve open.

Start button

Click to commence the test. This button changes to a *Cancel* button. Click the *Signature Results* tab to see data once the test completes.

Trend

Above the graph appear the presently detected values for the items shown on the graph. The graph displays these curves by color as:

- *Position* - blue line on the graph vs. Time. Displays the position of the valve is in percentage of valve opening at the top of the graph. 0% is always closed and 100% is open. Because the travel of a valve may exceed its nominal travel, positions greater than 100% are possible.
- *Actuator Pressure* - green on the graph vs. Time. Displays the pressure read by the sensor at the top of the graph.

Zoom the graph by right-clicking in the graph and dragging an area.

Unzoom by right-clicking in the graph.

Drag the graph by left-clicking, holding and moving the graph.

See “Results and Log Right-Click Menu” under Section 9.7 “Diagnostics: Offline Diagnostics: Standard Signature” for an explanation of graph functionality.

Results & Log

Displays the latest completed result: *Position* vs *Pressure* as a plot and the log of events to the right.

Click **Add Comment** 

to open the *Comment* dialog to add related notes. See Table 2 for an explanation of functionality.

Click **Clear Log** 

to clear the log space.

See “Results and Log Right-Click Menu” under 9.7 “Diagnostics: Offline Diagnostics: Standard Signature” for an explanation of graph right-click menu.

9.8.1 Perform an Extended Actuator Signature Test

The *Extended Actuator Signature* slowly ramps the pressure to the actuator up and down over a user selected position range and measures the position vs. pressure. The signature is useful for determining valve friction and for identifying performance problems at specific valve positions.

Results are measured and displayed in the *Trend* graph. After the test, data appears in the *Status* area.

To perform this test:

WARNING

This procedure moves the valve.
This results in loss of process control.

1. Ensure the system is in Setup mode.
2. Enter a *Start Position, Stop Position*, and *Speed Level*.
3. Click Start to run test.

   Test Log and test result curve appears after the test finished (Figure 77).

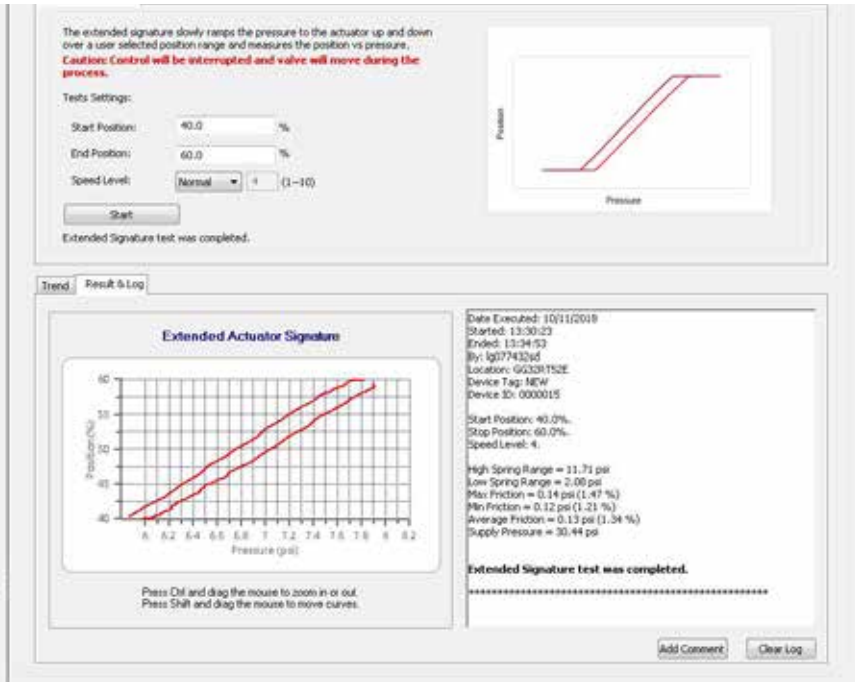


Figure 77 Diagnostics Extended Act. Sig. Test Results

9.9 Diagnostics: Offline Diagnostics: Step Test

The *Step Test* produces a time vs. position graph where the valve is submitted to a stepped input. The step profile may contain multiple steps. To run a step profile, you must enter the starting position, the ending position, the sample rate, the step time, and whether or not to measure both up and down steps.

The step test starts at the starting position and makes steps according to the *Step Time* field until the ending position is reached. For each step, the SVI3 measures the position at even time intervals using the *Sample Rate*. If two way is specified, when the end position is reached, the procedure is repeated from the end position to the start position.

Results are measured and displayed in the *Trend* and the *Results & Log* graphs.

Step test is not consecutive - i.e. it will finish that step, then drive to the next position for a time before starting the next step.

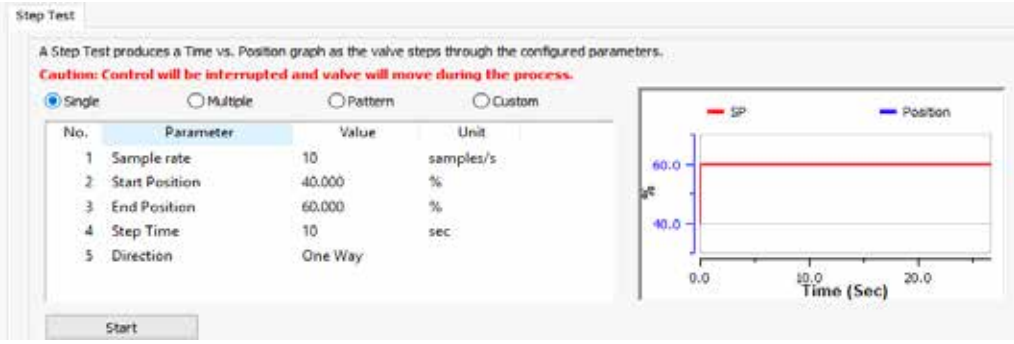


Figure 78 Step Test Single: Configuration

This test measures the step response characteristic of control valve system. There are four types of step response test:

Single	The single step test consists of a single step response test, with a start time, start point and end point for the test incremented by the step time. See Section 9.9.1 “Perform a Step Test”.
Multiple Steps	The multiple step response test consists of a series of single step response tests, with new set point for each following test incremented by the step size, executed consecutively in the overall user-specified range. All individual single step tests use the same user-specified step size except the last one, which uses the step size of the remaining portion. See Section 80 “Diagnostics Step Test Complete”.
Patterns	This test consists of steps where step size and timing are configurable. See Section 80 “Diagnostics Step Test Complete”.
Custom	Displays an empty table below where you can add settings to customize a test.

Buttons and Fields

Strep Test

Static graph	The graph is the upper right-hand corner is a static representation of the test type selected.
Sample Rate (samples/s)	Enter the number of samples to take per second. A higher rate produces a graphwith more data points. This extends the test time.
Start Position (%)	Enter the start position for the step test as percentage of valve open.
End Position (%)	Enter the stop position for the step test as percentage of valve open.
Step Time (sec)	Enter the time for each step. The SVI3 measures the position at even time inter-vals for the this amount of time.
Step Size (%)	Enter the size for each step during a *Multiple Steps* test only.
Around Type	*Around Middle*: Click to run the test centered on the middle of the test range (Multi Steps test only). • Around Current Setpoint: Click to run the test centered on the Current Set-point (Multi Steps test only).
Up/Down	Click one to run the test both ways or only one direction (Multi Steps test only): • *Both Ways*: Click to conduct the test only from the Start Position to the End Position and back to the Start Position. The values of the Start Position and the End Position determine the direction of the valve stem movement. When the value of the Start Position is more than that of the End Position, the valve steps down in one way trip, then steps up at return trip, if Both Ways is used. • *One Way/Two Way*: Click a button to determine if the test is for open or open and close.
Step Time	Enter the time to for each step during the test. The software then operates the test between the *Start Position* and *End Position* in this timeframe.
Step Inc(rease) (%)	Enter a percentage per each step. This is the step size, limited by *Max Step*, which along with the *Step Time* dictates the number of steps performed in the test range (Multi Steps test only).
Max Step (%)	Enter a percentage for limiting the maximum step size per step of the test range (Multi Steps test only).
Direction: One Way/Two Way	Click a button to determine if the test is for open or open and close.
 *Start* button	Click to commence the test. This button changes to a *Cancel* button. Click the *Signature Results* tab to see data once the test completes.

Trend

Above the graph appear the presently detected values for the items shown on the graph. The graph displays these curves by color as:

- *Position* - blue line on the graph vs. Time. Displays the position of the valve is in percentage of valve opening at the top of the graph. 0% is always closed and 100% is open. Because the travel of a valve may exceed its nominal travel, positions greater than 100% are possible.
- *Actuator Pressure* - green on the graph vs. Time. Displays the pressure read by the sensor at the top of the graph.

Zoom the graph by right-clicking in the graph and dragging an area.

Unzoom by right-clicking in the graph.

Drag the graph by left-clicking, holding and moving the graph.

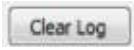
See “Results and Log Right-Click Menu” under Section 9.7 “Diagnostics: Offline Diagnostics: Standard Signature” for an explanation of graph functionality.

Results & Log

Displays the latest completed result: *Position* vs *Pressure* as a plot and the log of events to the right.

Click **Add Comment** 

to open the *Comment* dialog to add related notes. See Table 2 for an explanation of functionality.

Click **Clear Log** 

to clear the log space.

See “Results and Log Right-Click Menu” under 9.7 “Diagnostics: Offline Diagnostics: Standard Signature” for an explanation of graph right-click menu.
See Section 9.11 “View Diagnostics” to View Diagnostics tab.

9.9.1 Perform a Step Test

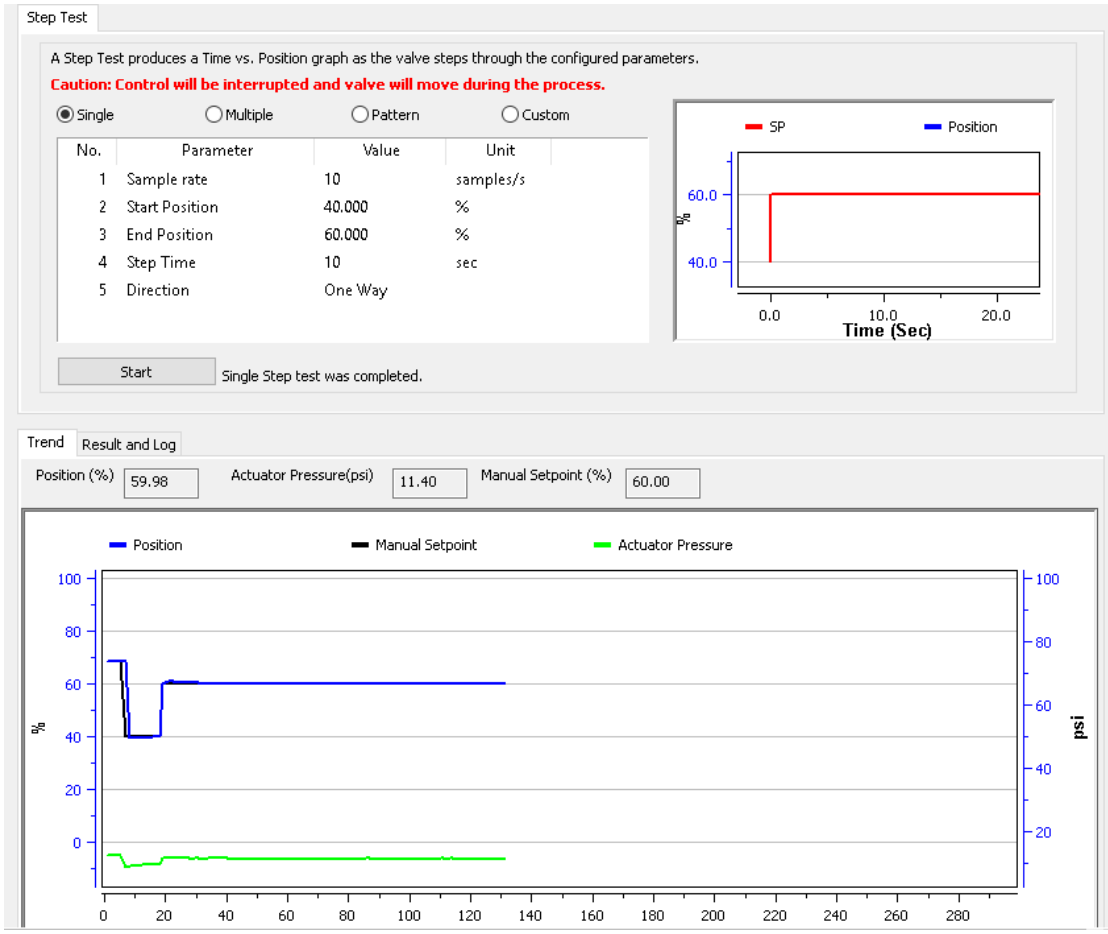


Figure 79 Diagnostic Step Test

WARNING

This procedure moves the valve.
This results in loss of process control.

1. Ensure the system is in Setup mode.
2. Click the **Step Test** tab and click the appropriate radio button for the type of the step test you wish to run (**Single/Multiple/Patterns/Custom**).
3. Configure the Step Test parameters as required.

4. Click Start to run the test.

The Test Log and test result curve appears after the test finished (Figure 80).

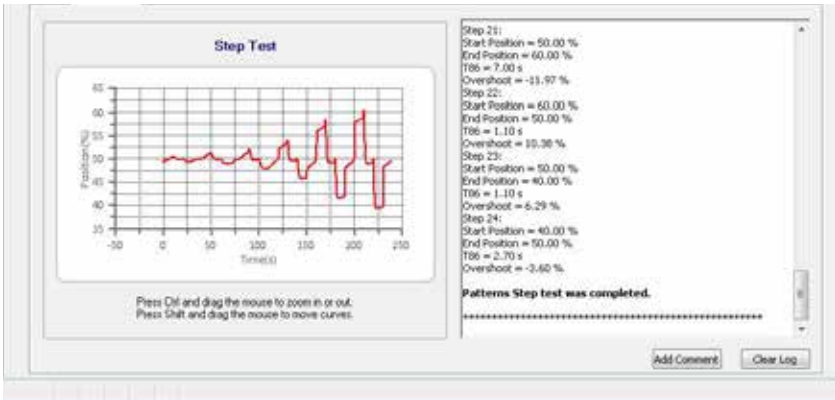


Figure 80 Diagnostics Step Test Complete

9.10 Diagnostics: Offline Diagnostics: Ramp Test

Use this tab to run the Ramp Test, which produces a *Setpoint* vs. *Position* graph for both directions of movement.

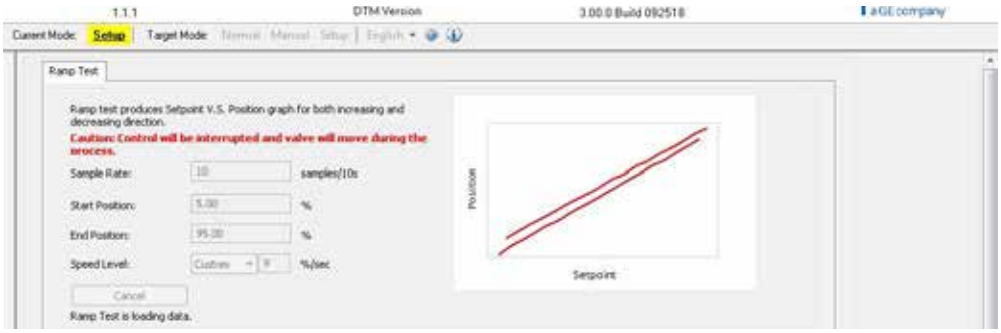


Figure 81 Ramp Test: Configuration

Buttons and Fields

Ramp Test

Static graph	The graph is the upper right-hand corner is a static representation of the test type selected.
Sample Rate (samples/s)	Enter the number of samples to take per second. A higher rate produces a graph with more data points. This extends the test time.
Start Position (%)	Enter the start position for the step test as percentage of valve open.
End Position (%)	Enter the stop position for the step test as percentage of valve open.

Speed Level

The speed level is the rate of speed at which the valve is moved as the test is performed, *1* is the slowest and *10* the fastest. The default speed level is *4*. This field can be adjusted to account for larger (larger actuator area involved) or smaller valves (smaller actuator area involved).

Start button

Click to commence the test. This button changes to a *Cancel* button. Click the *Signature Results* tab to see data once the test completes.

Trend

Above the graph appear the presently detected values for the items shown on the graph. The graph displays these curves by color as:

- *Position* - blue line on the graph vs. Time. Displays the position of the valve is in percentage of valve opening at the top of the graph. 0% is always closed and 100% is open. Because the travel of a valve may exceed its nominal travel, positions greater than 100% are possible.
- *Actuator Pressure* - green on the graph vs. Time. Displays the pressure read by the sensor at the top of the graph.

Zoom the graph by right-clicking in the graph and dragging an area.

Unzoom by right-clicking in the graph.

Drag the graph by left-clicking, holding and moving the graph.

See “Results and Log Right-Click Menu” under Section 9.7 “Diagnostics: Offline Diagnostics: Standard Signature” for an explanation of graph functionality.

Results & Log

Displays the latest completed result: *Position* vs *Pressure* as a plot and the log of events to the right.

Click **Add Comment** 

to open the *Comment* dialog to add related notes. See Table 2 for an explanation of functionality.

Click **Clear Log** 

to clear the log space.

See “Results and Log Right-Click Menu” under 9.7 “Diagnostics: Offline Diagnostics: Standard Signature” for an explanation of graph right-click menu.
See Section 9.11 “View Diagnostics” to View Diagnostics tab.

9.10.1 Perform a Ramp Test

The *Ramp Test* produces a position vs. input signal graph for both increasing and decreasing signal. The signal is a simulated signal so linearity cannot be checked. This test is also called a positioner signature test.

The *Status* field displays relevant messages and traces appear in the *Trend* graph.

To perform this test:

WARNING

This procedure moves the valve.
This results in loss of process control.

1.Ensure the system is in Setup mode.

2. Click the **Ramp Test** tab.

3. Enter a *Sample Rate, Start Position, End Position,* and *Speed Level.*

4. Click Start to run the test.

Test Log and test result curve appears after the test finished (Figure 82).

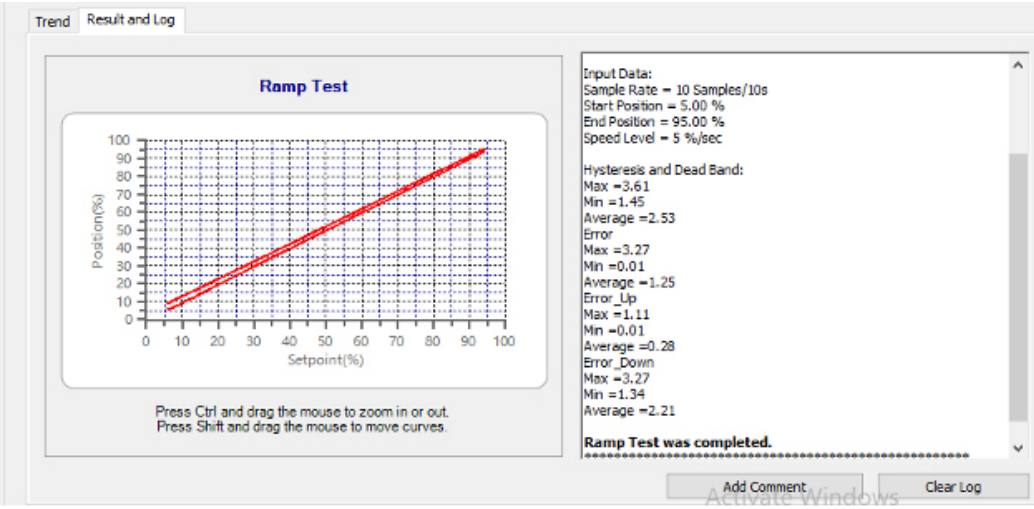
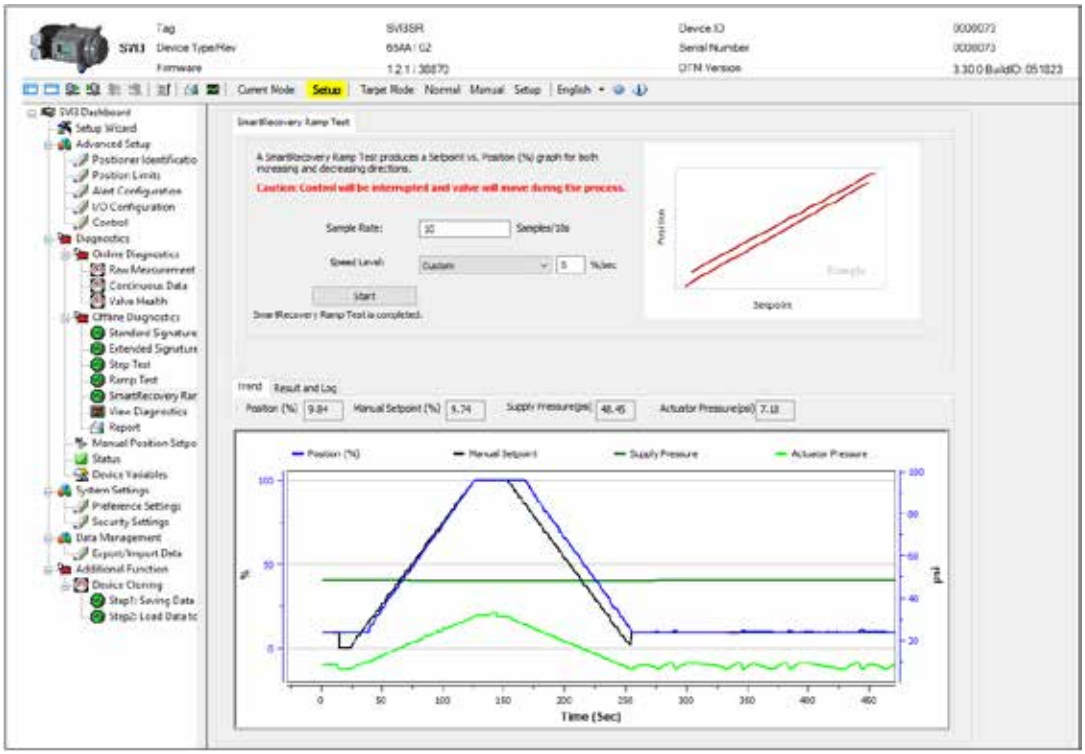


Figure 82 Diagnostics Ramp Test Results

9.11 Diagnostics: Offline Diagnostics: Smart Recovery Ramp Test

When SmartRecovery feature in SVI3 is enabled, the positioner support to perform Smart Recovery Ramp Test that produces a Set Point graph for both decreasing and increasing directions.



Buttons and Fields

Pressure Signature

Static graph — The graph in the upper right-hand corner is a static representation of the test type selected.

Speed Level — The speed level is the rate of speed at which the valve is moved as the test is performed, 1 is the slowest and 10 the fastest. The default speed level is 4. This field can be adjusted to account for larger (larger actuator area involved) or smaller valves (smaller actuator area involved).

Sample Rate — Enter the number of samples to take per 10 seconds. A higher rate produces a graph with more data points. This extends the test time.

Start button — Click to commence the test. This button changes to a Cancel button. Click the Result and Log tab to see data once the test completes.

Trend — Above the graph appears the presently detected values for the items shown on the graph.

The graph displays these curves by color as:

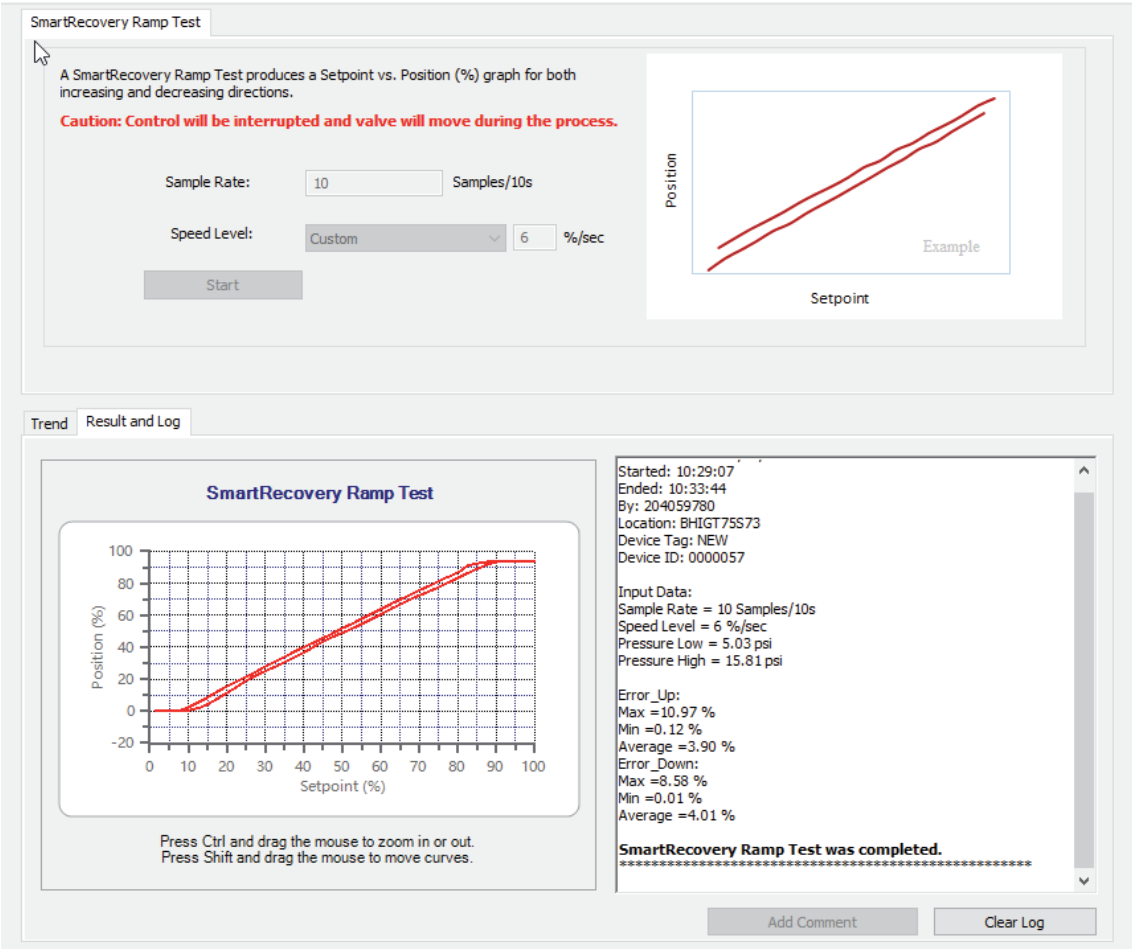
- *Position* - blue line on the graph vs. Time. Displays the Position at the top of the graph
- *Manual Setpoint* - black line on the graph vs. Time. Displays the Setpoint read by the sensor at the top of the graph
- *Supply Pressure* - dark green line on the graph vs. Time. Displays the Supply pressure of valve opening and closing at the top of the graph
- *Actuator Pressure* - light green line on the graph vs. Time. Displays the Actuator Pressure at the top of the graph

Results & Log

Displays the latest completed result: Pressure SP vs Actuator Pressure as a plot and the log of events to the right.

Click Add Comment to open the Comment dialog to add related notes.

Click Clear Log to clear the log space.



9.12 View Diagnostics

Use this tab to view a test that has just been run and load test of the same type for comparison from file or from the database. Use the right-click menu to import results and to format the graph as required. See “Results and Log Right-Click Menu” under Section 9.7 “Diagnostics: Offline Diagnostics: Standard Signature” for an explanation of functionality.

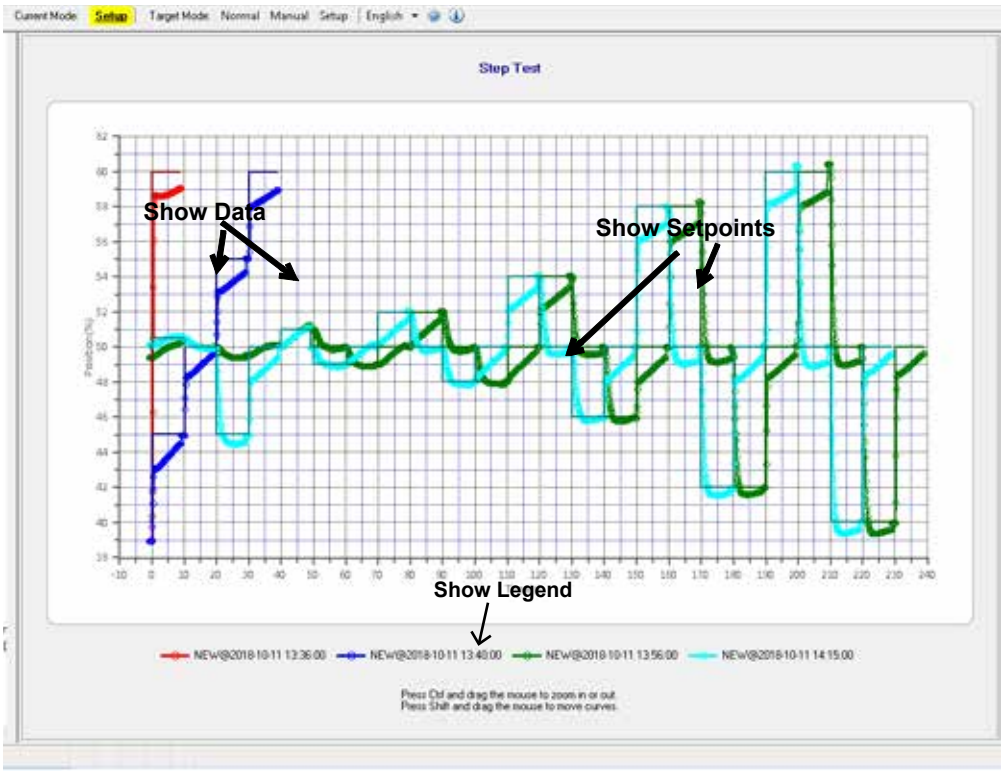


Figure 83 View Diagnostics

9.13 Diagnostics: Manual Position Setpoint

Use the *Manual Position Setpoint* screen to fully open the valve, fully close the valve or use the *Manual Setpoint* feature to input a setpoint in percentage of valve position or in signal range (mA).

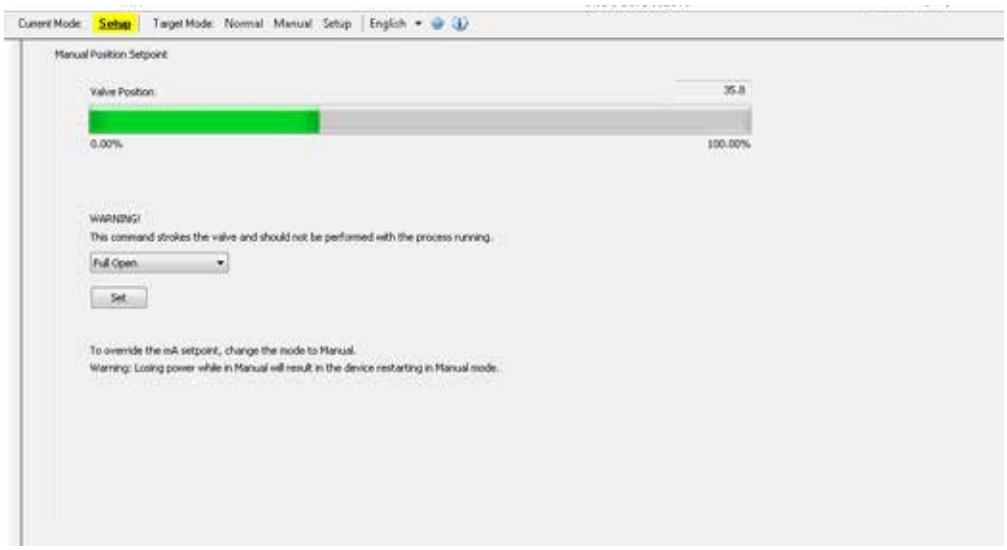


Figure 84 Diagnostics: Manual Position Setpoint

Buttons and Fields

Valve Position	Displays the valve position in a display bar and in a text field. the bar displays up to 100% of configured travel range. The text box displays the actual percentage. For example, if the valve is configured to travel 113% and it is at maximum travel, 113% appears.
Full Open	Use the pulldown to select this fully open the valve. This command takes the valve out of closed loop control and sends a high or low signal to the I/P. This is available only in Setup mode.
Full Close	Use the pulldown to select this fully close the valve. This takes the valve out of closed loop control and sends a high or low signal to the I/P. This is available only in Setup mode.
As a Position in %	Click and text field that appears. Enter a value and click **Set**. Range: -5 to 160%. To override this setting change the mode to *Setup* or *Manual*. This is available in Setup and Manual mode.
As Signal in mA	Click and text field that appears. Enter a value and click **Set**. Range 4 to 20 mA. To override this setting change the mode to *Setup* or *Manual*. This is available in Setup and Manual mode.
 *Set* button	Sets the configured items to the positioner.

9.14 Diagnostics: Status: Faults

Use the *Status* tab to see the SVI3 operating and internal status. The screen is divided into a series of tabs that provide status, alarm, and fault information in a graphical form for all aspects of the system.

Each alarm condition is color coded according to the criticality of the alarm:

- Low
- Medium (error conditions that can occur in normal operation, not faults, that may presently exist or have historically existed)
- High (indicates a fault)
- Indicates no faults

On the *Status* tab you can reset the *Current Faults* or *All Faults* (Current and Historical). The window has selectable tabs that display the associated parameters for each diagnostic category. When you are on the *Active Faults* tab the current active faults appears (Figure 85). Mouse hover over a fault for a fault definition. Refer IOM for additional details. For information regarding the faults, please refer fault matrix.

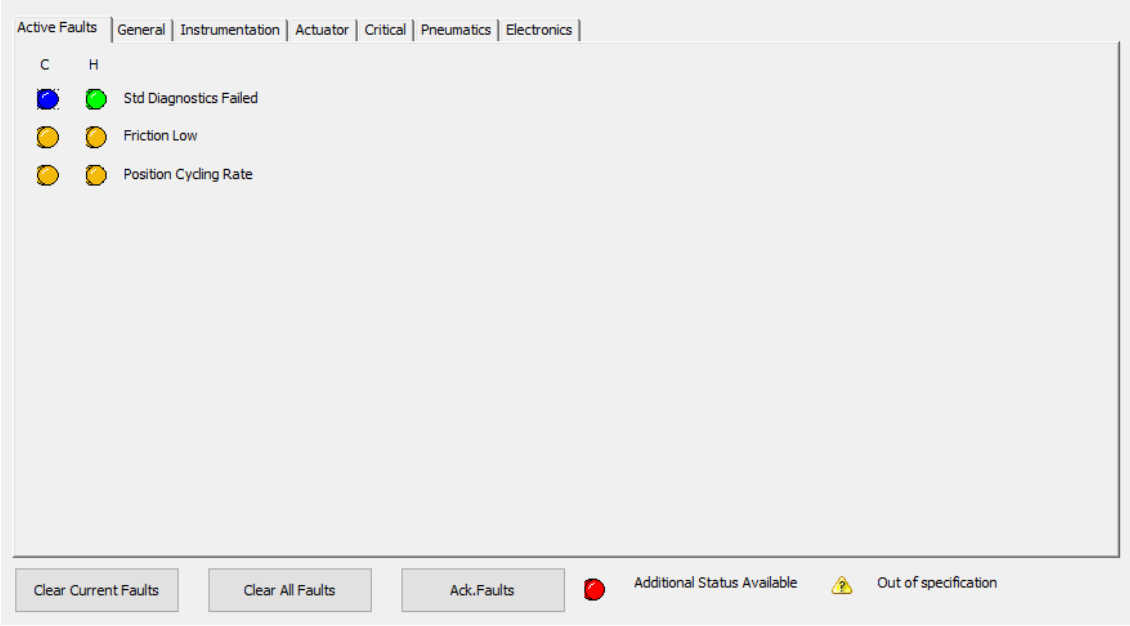


Figure 85 Diagnostics: Active Faults

Buttons and Fields

Clear Current Faults *Clear Current Faults* button	Click to clear *Current Faults*, if the fault cause no longer exists.
Clear All Faults *Clear All Faults* button	Click to clear *Current Faults* and *Historical Faults*, if the fault cause no longer exists.
Ack.Faults *Ack Faults* button	Click to acknowledge all the faults on this tab. This does not clear the cause of the fault but it will clear Additional Status Available indicator until the device fault status changes.
Additional Status Availabl *Additional Status* indicator	Indicates that additional information is available. See the individual *Status* tabs**.** Additional Status Available: Green - No fault Red - Faults available at any criticality level
NAMUR NE 107 icon	• Add NAMUR NE 107 icon and category description, as shown in Figure 86. • The NE 107 icon indicator locations are shown in Figure 86.

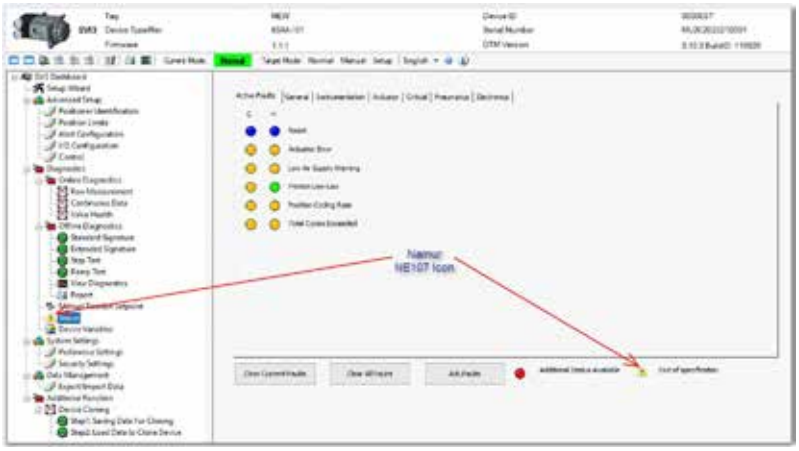


Figure 86 NAMUR NE 107 icon indicator Location

Failed	Out of Specification	Maintenance Required	Check Function
High severity: signal invalid due to malfunction in the device, sensor, or actuator	Medium severity: permissible ambient or process conditions exceeded or the measuring uncertainty of sensors or deviations from the set value in actuators is probably greater than expected	Low severity (advisory): although the signal is valid, the remaining life is nearly exhausted or a function will soon be restricted due to operational conditions	Signal temporarily invalid (e.g. frozen) due to on-going work on the device

Figure 87 NAMUR NE 107 icon indicators

9.15 Diagnostics: Device Variables

Use this screen to select and display a dynamically updated list of all device variables, including *Parameter*, *Value*, *Unit* and *Status*. For switches only the state is listed. You can select the data for display by activating the associated checkbox.

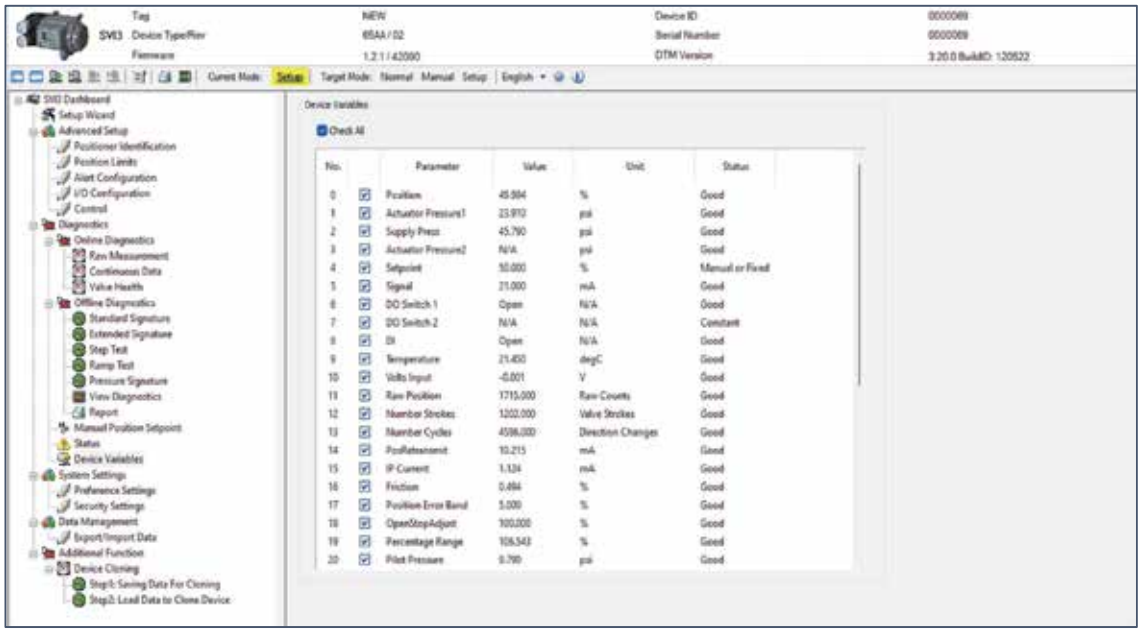


Figure 88 Diagnostics: Device Variables

10. System Settings

10.1 Preference Settings

Use this screen to set user preferred settings for the DTM.

Settings

Use this area to configure target locations for various file types.

Function Settings for DTM

Use this area to configure some general behaviors seen throughout DTM operations

The file paths to where you want various reports and data saved, and configure DTM settings.

CAUTION

After a new install of the program, these settings return to their defaults.

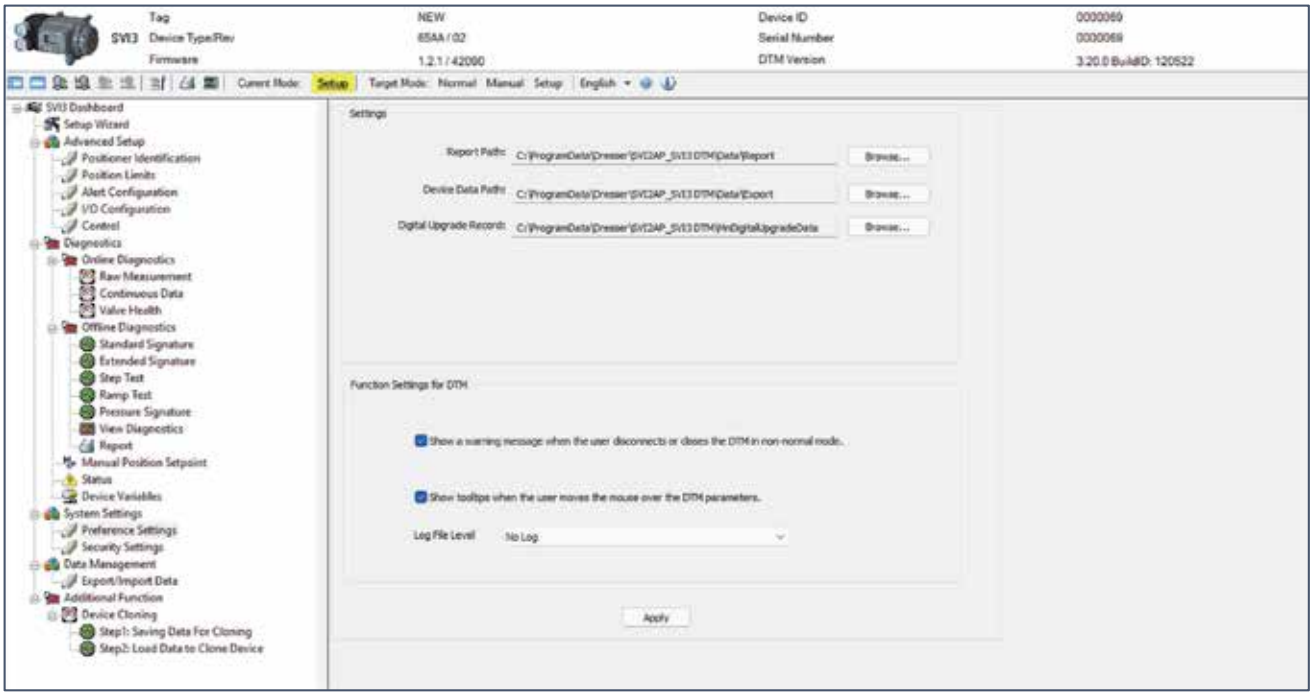


Figure 89 Preference Settings

Settings

Report Path — This is the report generated using the *Print Report* icon from the SVI3 icon bar.

Device Data Path — The path where the device data is saved. This is useful when transferring data for offline study on another PC.

Digital Upgrade Record — The path where the digital upgrade data is saved as a database record.

Function Settings for DTM

Warning Message Status — Activate to display a warning message when the DTM is closed while not in *Normal* mode and click **Apply**.

WARNING

*If the DTM is closed in any other mode, the control loop **will not** be engaged, which represents a dangerous state.*

Tooltips — Activate to turnoff tooltips and click **Apply**.

Log File Level

Use the pulldown list to select the type of log file to keep:

No Log: Disables logging of events.

Log Error Only: Enables logging of error level events, including exceptions and internal errors.

Log Detail: Enable logging of HART communication events.

Apply button

Click **Apply** to save any path or log file changes.

10.2 Security Settings

Use this tab to change the access levels for the various roles in the DTM. The roles are industry standard, but you can change the role's privileges. To access this tab, you must have a *Administrator* level privileges. Additionally, you can load security settings that were previously created for another SVI3 (Section 10.2.2 "Load Security Settings from File") and saved into a security file (.sec format) and save the present settings to the default file for later use (Section 10.2.3 "Save Security Settings to File"). The default file settings are represented in Figure 90.

To access this screen (available to administrator only):

1. Click a device.
2. Select **System Settings > Security Settings**.

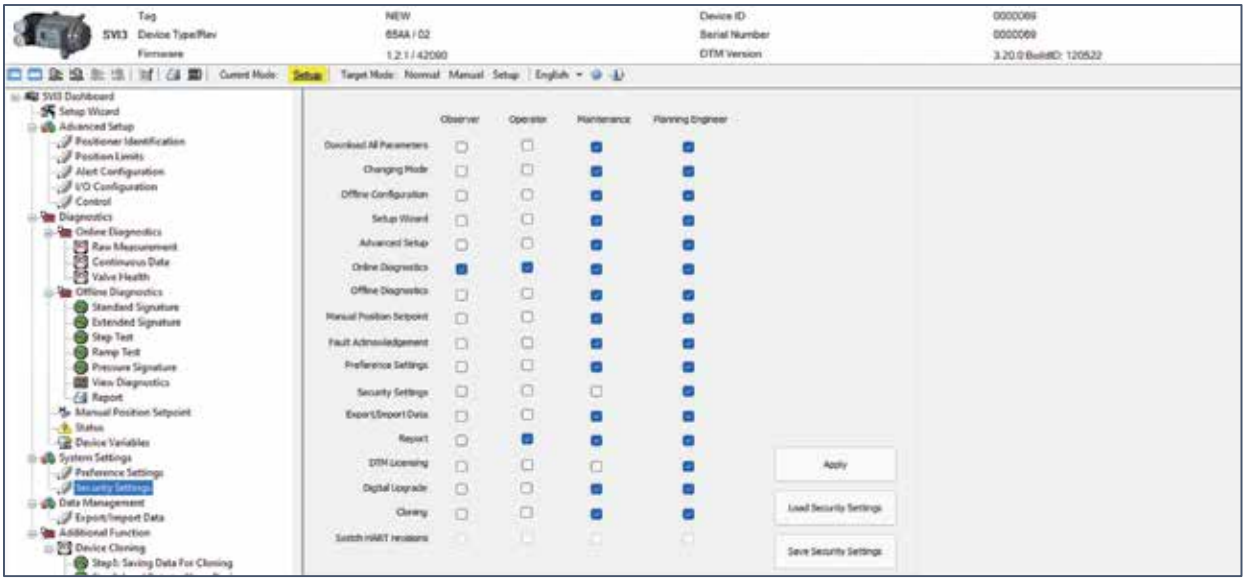


Figure 90 Security Settings

10.2.1 Change Privileges To change privileges:

1. Change the user role's checkboxes as required.
2. Click Apply

10.2.2 Load Security Settings from File

1. Click Load Security Settings and a dialog appears.

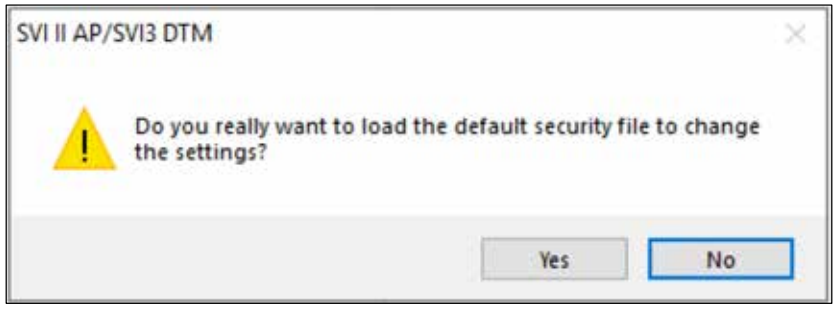


Figure 91 Load Security Settings

2. Click Yes and the settings are loaded and the settings from the default file populate into the tab.
3. Change the user role's checkboxes as required.
4. Click Apply.

   You must click Apply to save the settings to the positioner even if the only changes are the ones from loading the default settings.

10.2.3 Save Security Settings to File

1. Click Save Security Settings and a confirmation dialog appears (Figure 92).

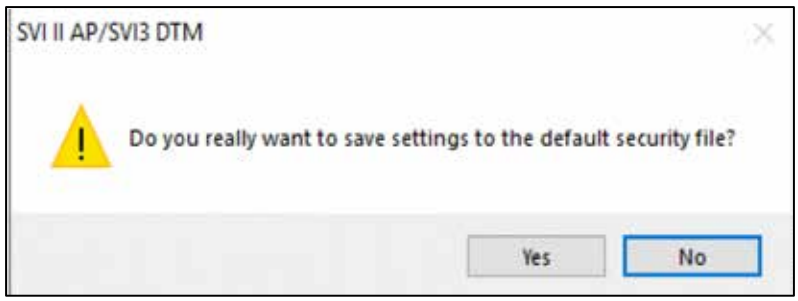


Figure 92 Save Security Settings to Default File Confirmation

2. Click Yes and the settings are saved.

11. Data Management

11.1 Data Management: Export/Import Data

Use this tab to manage data:

- *Export:* Export a DevData file that includes DTM configuration data, diagnostic test data and valve health data to a specified path. Default path is C:\ProgramData\Dresser\SVI2AP_SVI3DTM\Data\Export. User can change the export path in Preference Setting page.
- *Configuration*: Manage just configuration data for the positioner/valve. See Section 11.1.2 “Configuration”.
- *Diagnostics Results*: Manage just diagnostics results for the positioner/valve. See Section 11.1.3 “Diagnostic Results”.
- *Valve Health*: Manage just the Valve Health Limits for the positioner/valve, See Section 11.1.4 “Valve Health”. For a discussion of Valve Health Limits, see Section 9.4 “Diagnostics: Online Diagnostics: Valve Health”.
- *Import All:* Import a DevData file that includes DTM configuration data, diagnostic test data and valve health data into current DTM instance.

11.1.1 Export

Click **Export** button on DTM Data Management page, the following message appears. A Devdata file is generated under the path that displays in the message.

The devdata file contains configuration data, diagnostic tests and valve health data of current DTM.

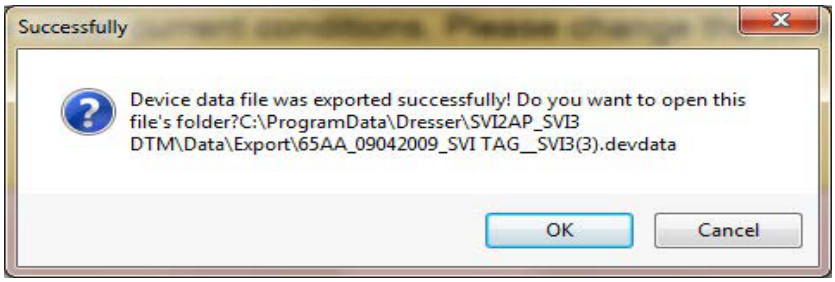


Figure 93 Export Devdata file successfully

11.1.2 Configuration

Use this tab to:

- *Import Configuration*: Imports all device configuration parameters, but not diagnostic results, from file (.*devdata* file).

The Valve Health Limits are grouped as they appear on various configuration tabs throughout the SVI3 DTM.

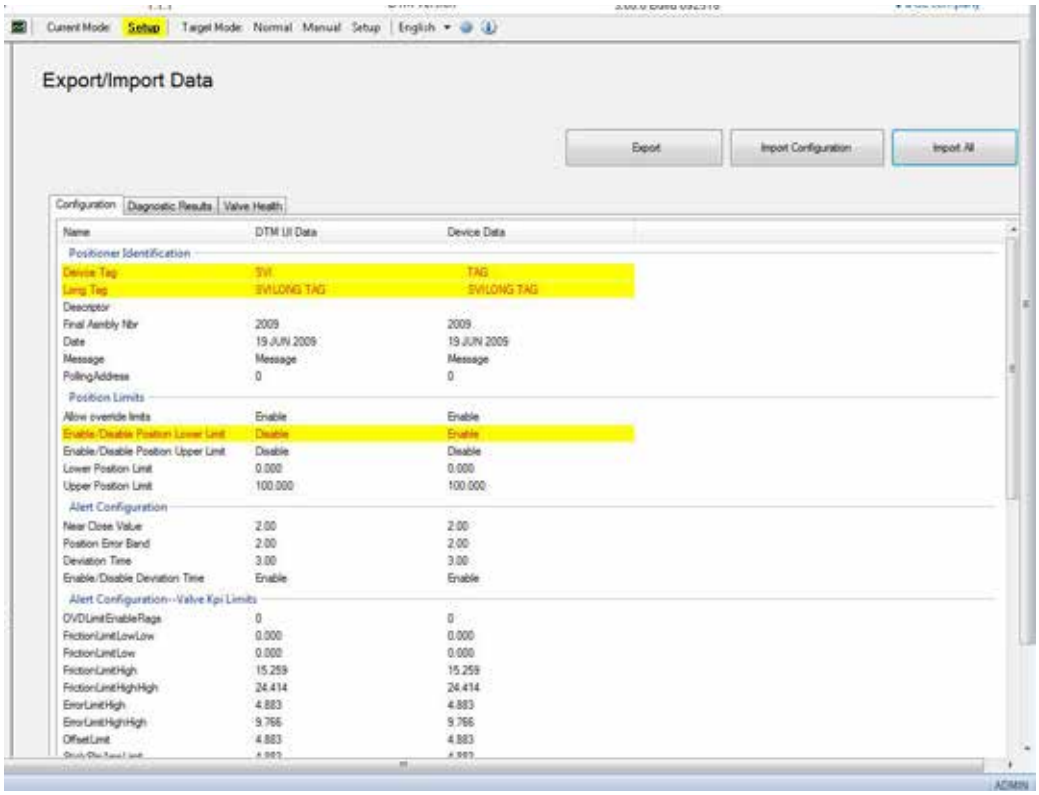


Figure 94 Data Management: Configuration

Buttons and Fields

Import Configuration *Import Configuration*	Click this radio button click and an *Open* dialog appears to import an existing positioner configuration as a device template file**.** A .*devdata* is usable. Once imported you can select desired data and download. See “Import Configuration” under Section 11.1.2 “Configuration”.

Import Configuration

1. Click **Import Configuration** button and Figure 95 appears.

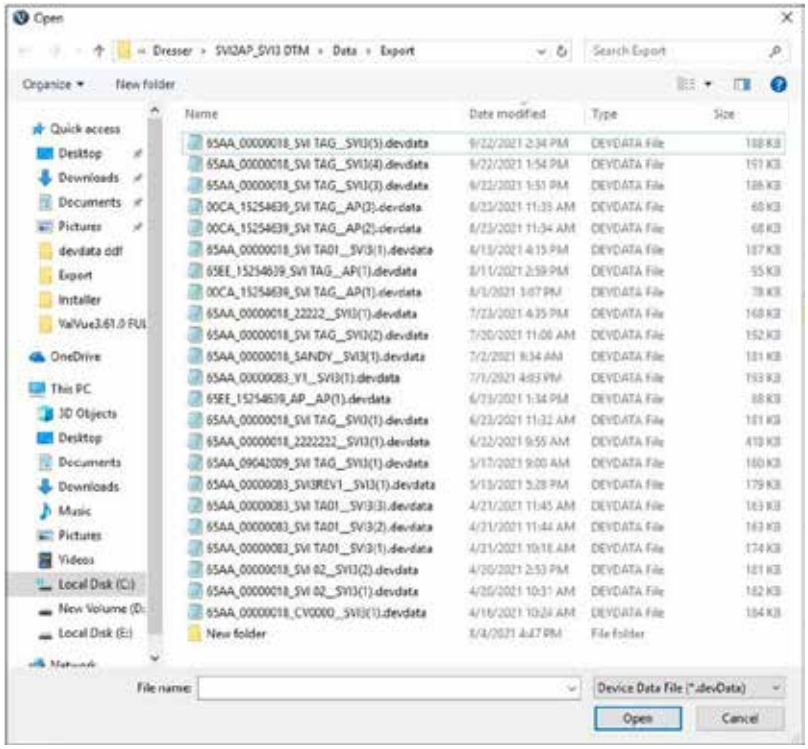


Figure 95 Import Configuration: Open

2. Navigate to the required directory, select the file and click **Open** and Figure 96 appears. This was saved to the default directory - the target directory can be changed, but ensure you record any change.

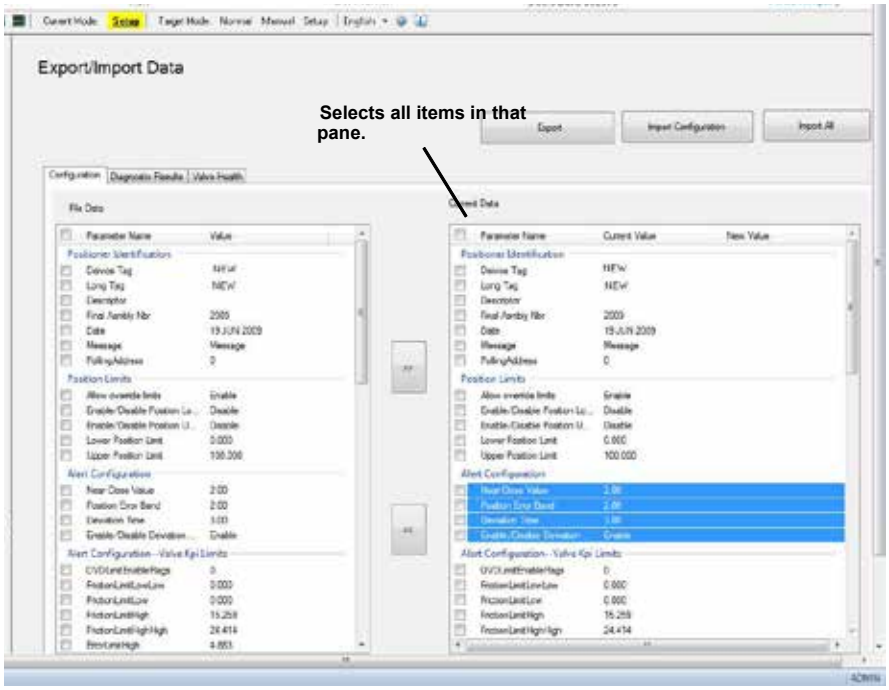


Figure 96 Import Configuration: Select Desired Data

The system changes to show the *File Data* in the left pane and the *Current Data*, current positioner data, in the right pane.

3. Select all the data from the *File Data* pane or use the checkboxes to select individual data items.
4. Click **Update Selected** and these items are updated to the *Current Data* pane. Updated items appear in yellow (Figure 97).

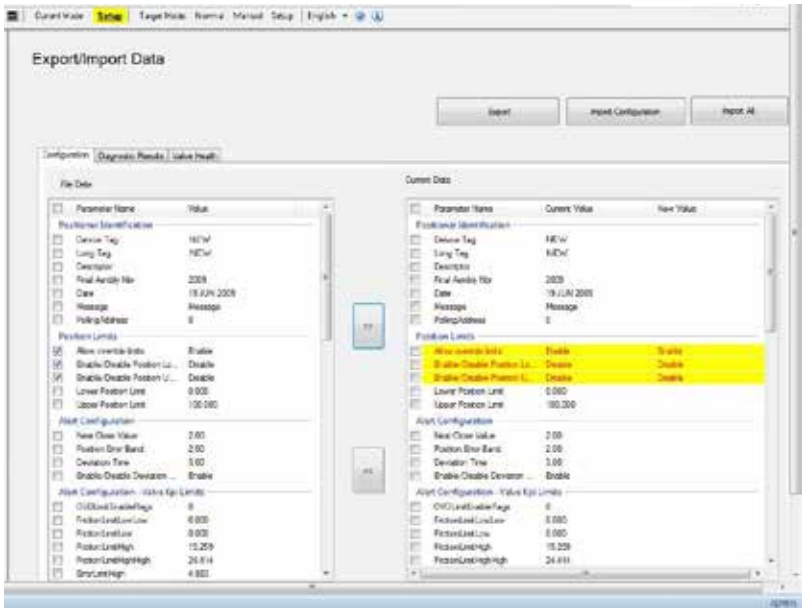


Figure 97 Import Data: Updated Items

Note: At this point you review your choices. If there is an item in the Current Data pane that is unwanted, click its associated checkbox and click "Undo Selected" to remove it.

5. Ensure all your selections are valid and click either:
   - Click **Apply** and Figure 98 appears.

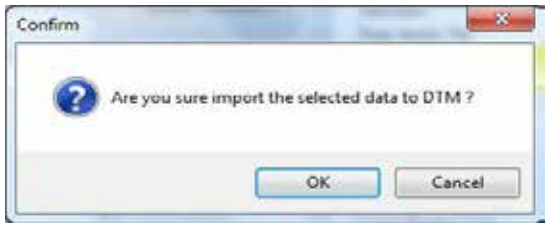


Figure 98 Apply

or

- Click **Apply and Download** to apply and at the same time download to the positioner and a dialog appears**.**
- Click **OK.**

11.1.3 Diagnostic Results

Use this tab to:

• *Import* Diagnostics: Imports selected or all diagnostic test results.

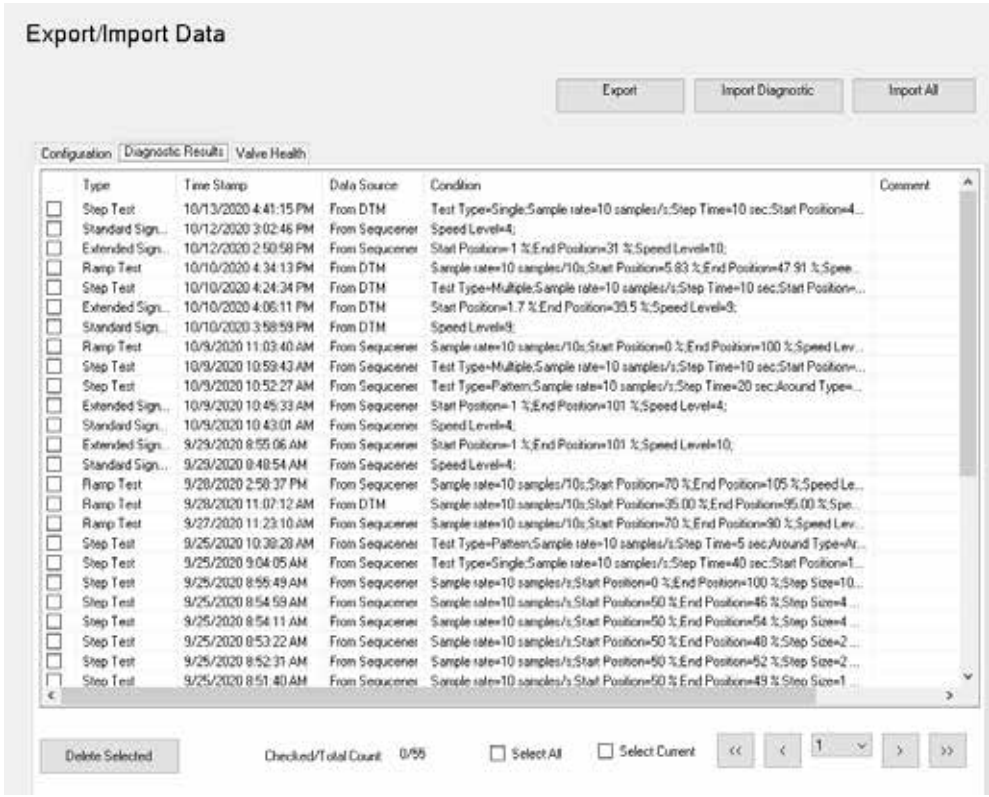


Figure 99 Data Management: Diagnostic Results

Buttons and Fields

Import Diagnostic *Import Diagnostics*	Click this radio button click and an *Open* dialog appears to import an existing positioner's diagnostic results**.** A *.devdata* is usable. Once imported you can select desired data and download. See "Import Diagnostic" under 11.1.3 "Diagnostic Results".

Import Diagnostic

1. Click **Import Diagnostic** button and Figure 100 appears. SVI3 DTM allows to import diagnostic test data through four types of files: DevData, DDF (including DDF and DDF2) and Dgn formats.

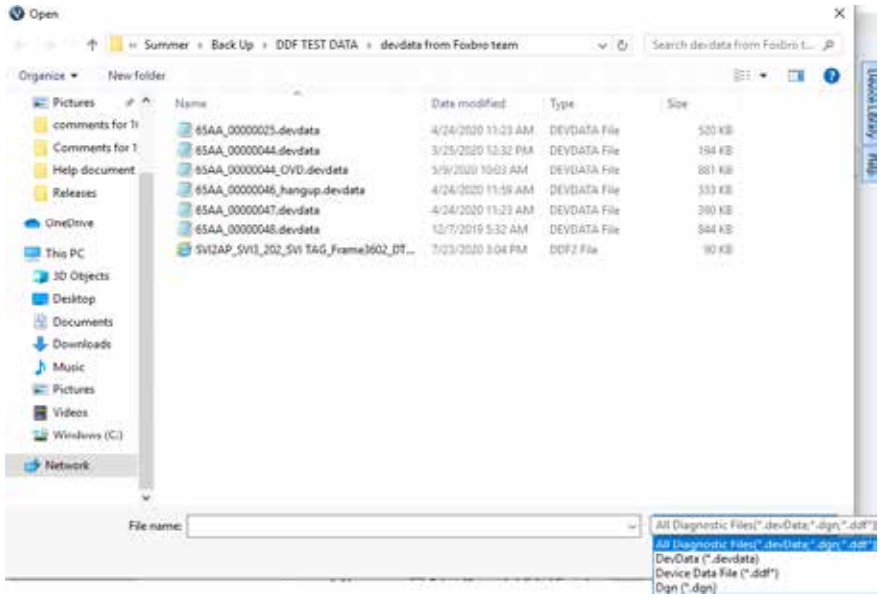


Figure 100 Import Diagnostic: Open

2. Select the file and click **Open** and Figure 101 appears.

Figure 101 Diagnostic Results From File

3. Note that a test result can be viewed/verified by double clicking selected test.

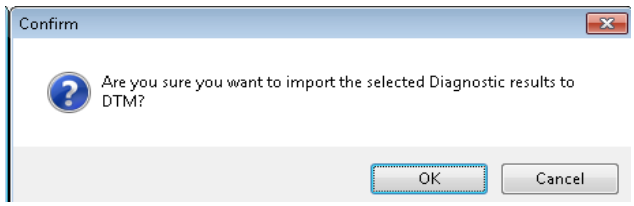


Figure 102 Confirm Import

4. Click **OK** and Figure 103 appears with the items imported. A selected test result can be viewed by double click or deleted by clicking Delete Selected button.

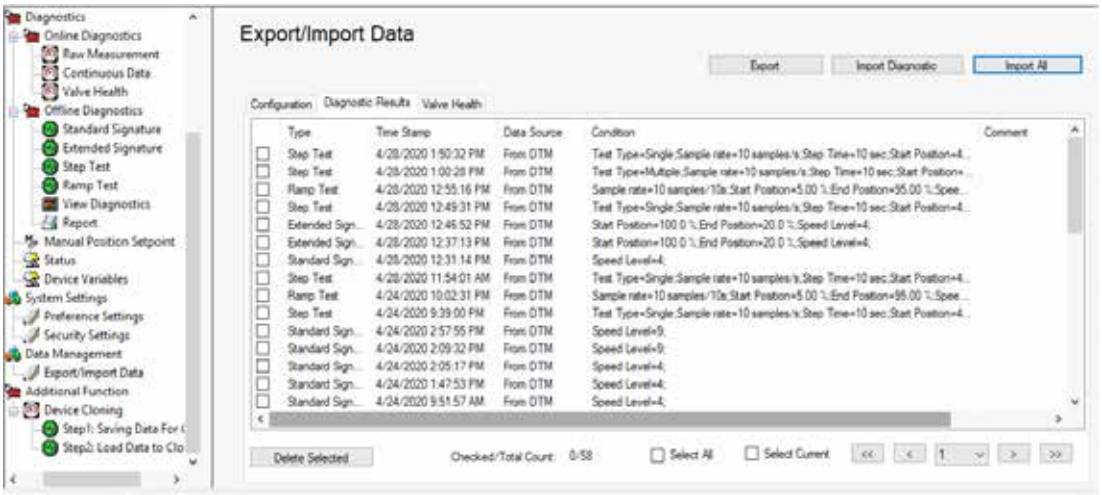


Figure 103 Diagnostic Results Imported

11.1.4 Valve Health

Use this tab to:

- *Import Valve KPI*: Imports all KPI results, from file (.*devdata* file).

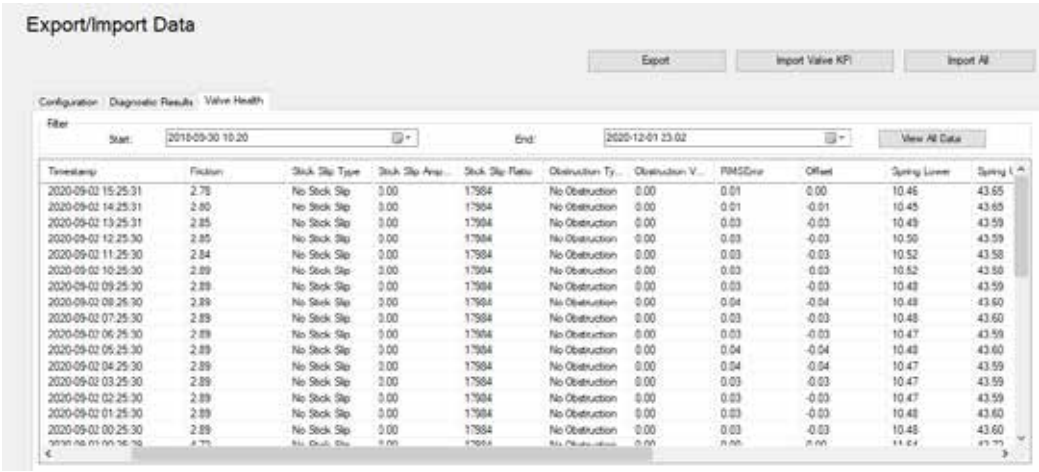


Figure 104 Data Management: Valve Health

Buttons and Fields

Start/End	Click the down arrow to access a calendar to select a starts and end for a date range for KPI data. This is then sorted and displayed below.

Buttons and Fields

View All Data button

Click this button and any applied filters are cleared and all records in the database populate the fields below.

Import Valve KPI button

Click this radio button click and an *Open* dialog appears to import an exist-ing positioner's KPI results**.** A *.devdata* is usable. Once imported you can select desired data and download. See "Import Valve KPI" under Section 11.1.4 "Valve Health".

Import Valve KPI

1. Click **Import Valve KPI** button and Figure 105 appears.

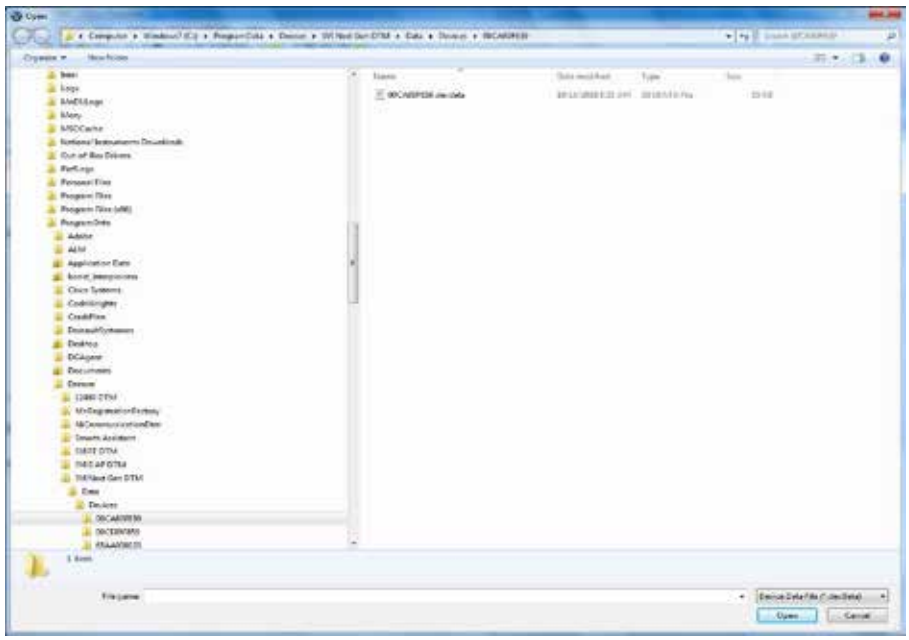


Figure 105 Import Valve KPI: Open

2. Navigate to the required directory, select the file and click **Open** and Figure 96 appears. The target directory can be changed, but ensure you record any change.

11.1.5 Import All

Click **Import All** button on DTM Data Management page, an Open window as below appears, then navigate to a directory where Devdata files are stored.

Choose one Devdata file to open, the data saved in the devdata file including configuration, diagnostic test and valve health KPIs can be imported into the current DTM instance.

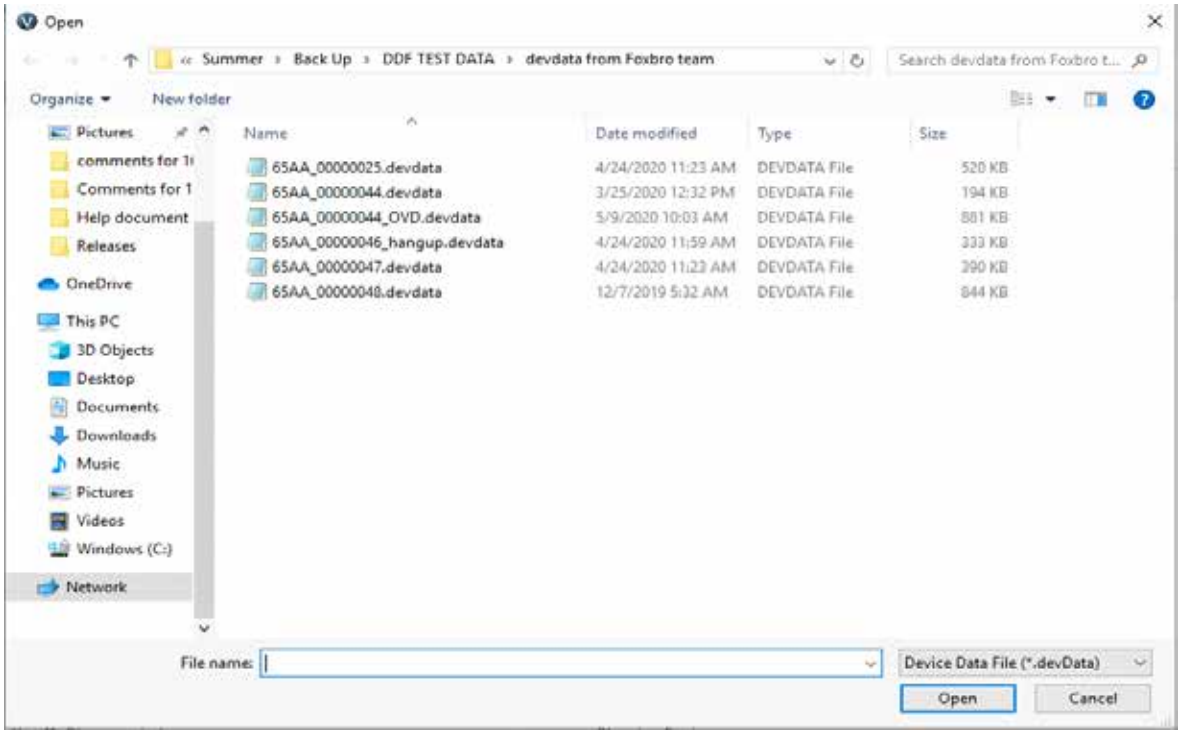


Figure 106 Import All: Open

12. Device Cloning

12.1 Additional Function: Device Cloning

Use this procedure to clone the settings for the purpose of either:

- Replacing the positioner without going through a commissioning sequence that takes the positioner out of process control.

or

- Using an existing positioner configuration as a basis for another positioner.

This process is two part:

1. Section 12.1.1 “Saving Data for Cloning”
2. Section 12.1.2 “Loading Data to Clone Device”

12.1.1 Saving Data for Cloning

This procedure assumes you are using ValVue3 and the SVI3 DTM:

1. Open ValVue3 and the SVI3 DTM main screen appears (Figure 107).

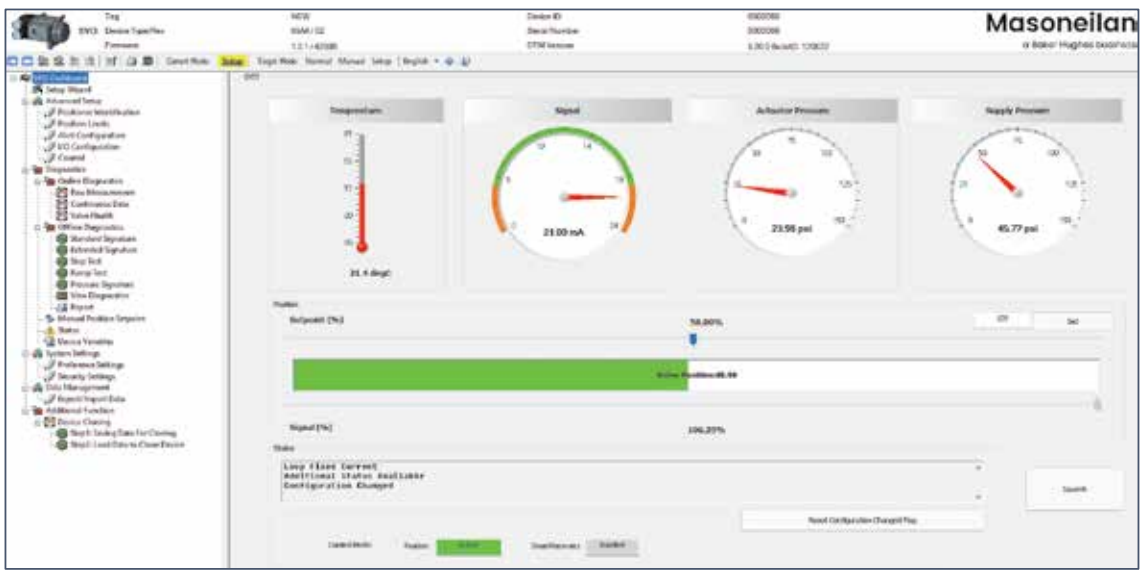


Figure 107 ValVue3 Main Screen

2. Click the **Connect** icon ( ) and ensure that the system properly connects. If not, ensure that the system is properly wired and then see Section 3.2.2 “Failure to Communicate”.

3. Ensure the valve is in *Setup* mode or you are prompted to do so.

4. Click **Step 1: Saving Data for Cloning** in the navigation pane and Figure 108 appears.

Figure 108 Save Data

5. Click **OK** and follow the instructions on the DTM to run the sequence and save the data.
6. Note the file name for the second part of the procedure.
7. Ensure all conditions that appear on DTM screen are met and then click **OK** and proceed to Section 12.1.2 “Loading Data to Clone Device”.

12.1.2 Loading Data to Clone Device

1. Open ValVue3 and the main screen appears (Figure 107).
2. Click the **Connect** icon ( ) and ensure that the system properly connects. If not, ensure that the system is properly wired and then see Section 3.2.2 “Failure to Communicate”.
3. Ensure the valve is in *Setup* mode or you are prompted to do so.
4. Click **Step 2: Load Data to Clone Device** in the navigation pane and Figure 109 appears.

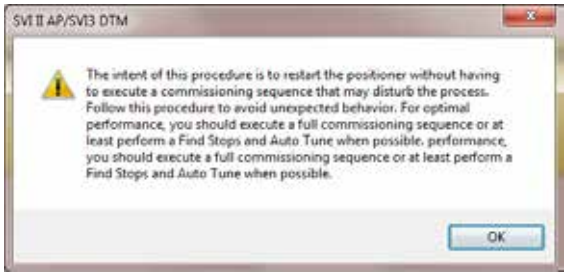


Figure 109 Load Data to Clone Device

5. Click OK and follow the instructions on the DTM to run the sequence and load the data to Clone Device.
6. Once complete, Figure 110 appears.

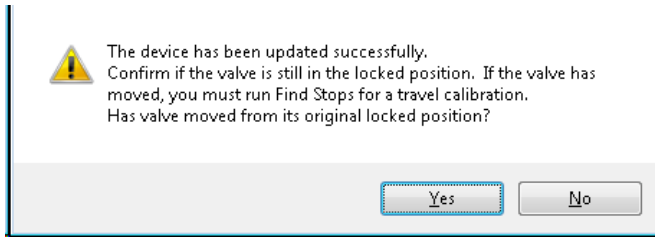


Figure 110 Device Update Successful

7. Click:
   • **Yes** if the valve has moved and Figure 111 appears.

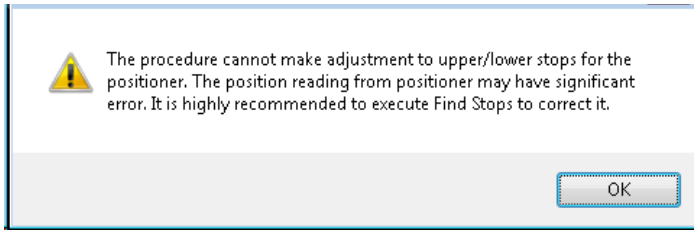


Figure 111 Execute Find Stops Recommendation

   • **No**, and the procedure is complete.

13. Topology Additional Functions

Access these menu item, select the positioner, right-click, and select **Additional Functions**.

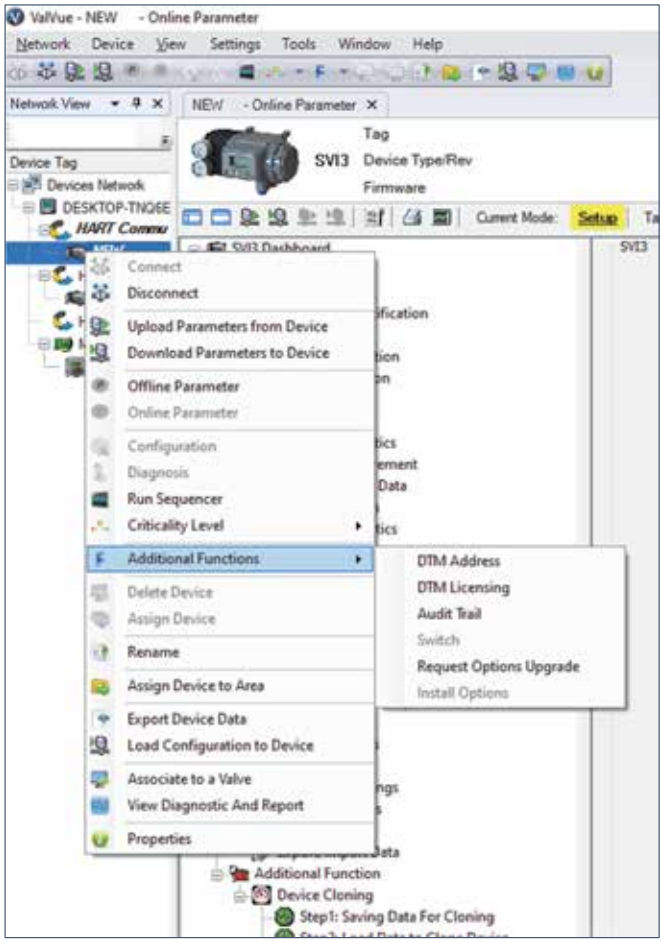


Figure 112 Additional Functions Items

13.1 Additional Functions: DTM Address

Use this screen (Figure 113) to change the polling address where the device you want to connect to the DTM is located.

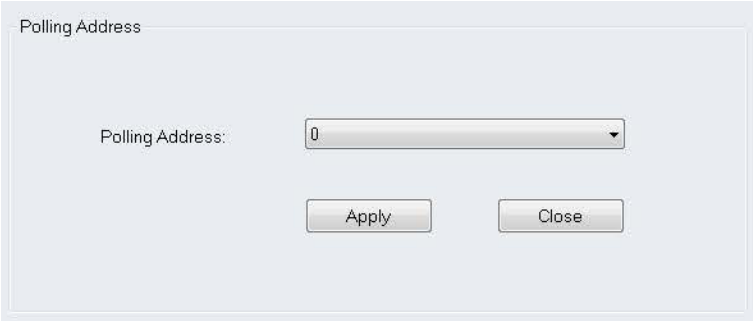


Figure 113 Polling Address

1. Use the pulldown to select the desired polling address.
2. Click **Apply**.
3. Right-click on the positioner in the topology pane and click **Connect**.

13.2 Additional Functions: DTM Licensing

This function guides user to register DTM license and view the specifics of your DTM license. This functionality is explained in Section 2 “Registration Process”.

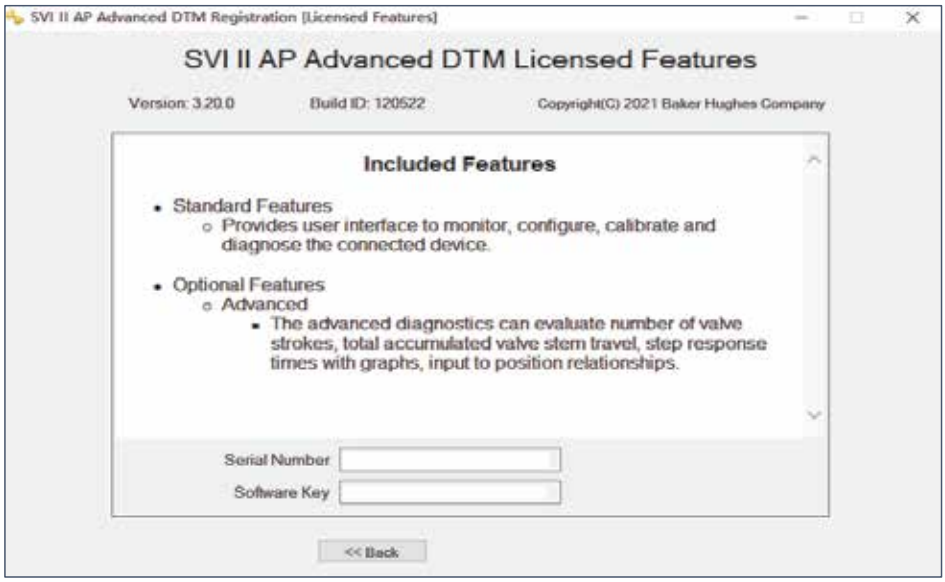


Figure 114 Additional Functions: DTM License

13.3 Additional Functions: Audit Trail

Use this screen to view a log of user actions. You can sort the columns using standard Windows functions.

To open the audit trail dialog:

- Right-click the SVI3 device in the *Project* pane and select **Additional Functions** > **Audit Trail** and Figure 115 appears.

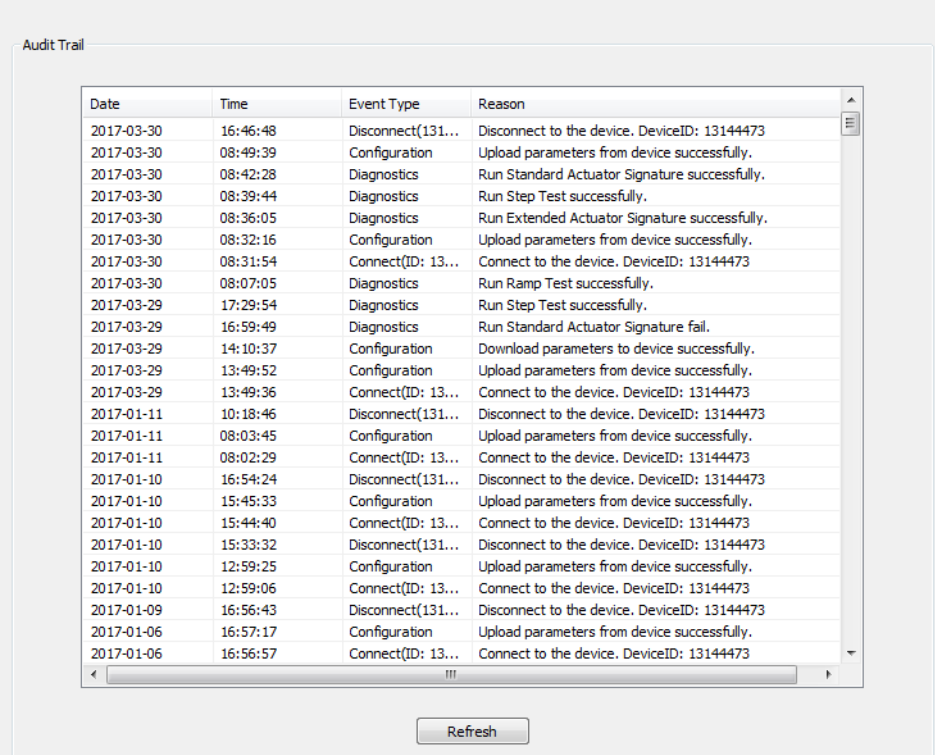


Figure 115 Audit Trail

Buttons and Fields

Date	Displays the date the event occurred.
Time	Displays the time the event occurred.
Event Type	Displays the event type.
Reason	Displays the reason for the event.
 *Refresh* button	Click to populate the screen with events since the screen was opened.

Table 5 lists the events specific to the SVI3.

Table 5 Audit Trail Events for the SVI3

Event Category	Event Description
Diagnostics	Run Ramp Test successfully
	Run Ramp Test fail.
	Run Standard Actuator Signature fail.
	Run Standard Actuator Signature successfully.
	Run Step test successfully.
	Run Step Test fail.
	Run SmartRecovery Ramp Test successfully.
	Run SmartRecovery Ramp Test failed.
	Reset Continuous Diagnostic Data successfully.
	Run Clear All Faults successfully.
	Run Clear Current Faults successfully.
	Reset SVI3 AP successfully.
Calibration	Run Autotune successfully.
	Run Autotune fail.
	Run Automatic Find Stops successfully.
	Run Automatic Find Stops fail.
	Set Valve Position to XXXXXX as signal in mA.
	The full closed done.
	The full open done.
	Write Open Stop Adjustment parameter successfully.
	Run Live Tuning successfully.
	Run Manual Find Stops successfully.
	Run Manual Find Stops fail.
	The calibration has been reset.
	The pressure calibration changed.
	The signal calibration finished.
	Run Pressure calibration failed.
	The open stop adjustment changed.

Table 5 Audit Trail Events for the SVI3

Event Category	Event Description
Configuration	Download parameters to device successfully.
	Write Commission configuration parameters successfully.
	Write Retransmitter Range parameters successfully.
	Write Output Switches parameters successfully.
	Write Device Info parameters successfully.
	Write Air Action parameters successfully.
	Write PID configuration parameters successfully.
	Write Position limits configuration parameters successfully.
	Write General configuration parameters successfully.
	Write HART configuration parameters successfully.
	Write I/O configuration parameters successfully.
	Write Option configuration parameters successfully.
	Reset Configuration Changed status.
Digital Upgrade	Records digital upgrade event.
Cloning	Leads you through the process to clone the device.
Reset	Reset incidents.
Connect	Connect to the device. DeviceID: xxxxxxxxxxxxx
Disconnect	Disconnect to the device. DeviceID: xxxxxxxxxxxxx
Factory Edition	Record the event that ValVue3 temporarily upgrades the diagnostic level of SVI3 device to run Signature tests through SVI3 DTM.
Data Management	Record the events that user exports/Imports device data at DTM side.
Report	Record print DTM report event.

13.4 Additional Functions: Digital Upgrade

The SVI3 digital upgrade process starts from customer to place an order for purchasing upgrades at iStore based on part numbers listed below:

The Part Number for SVI3 upgrades are:

Part Numbers	Description	Respective Model Numbers
720086711-888-0000	Upgrade from Std to Adv Diagnostics	From SVI3 - 1xxxxxxx to SVI3 - 2xxxxxxx
720086712-888-0000	Upgrade from Std to OVD Diagnostics	From SVI3 - 1xxxxxxx to SVI3 - 3xxxxxxx
720086713-888-0000	Upgrade from Adv to OVD Diagnostics	From SVI3 - 2xxxxxxx to SVI3 - 3xxxxxxx

Upon receipt of the order, Baker Hughes will send an email response to user with Upgrade Key. With this Upgrade Key, combining with user contact information and device serial numbers, user can generate an Upgrade Request file (.xdev) by using **Request Options Upgrade** of DTM, and send to Baker Hughes.

Baker Hughes will then provide user an option file (.xopt) for performing the digital upgrade.

Figure 116 is a flowchart of the entire process for requesting and installing an upgrade.

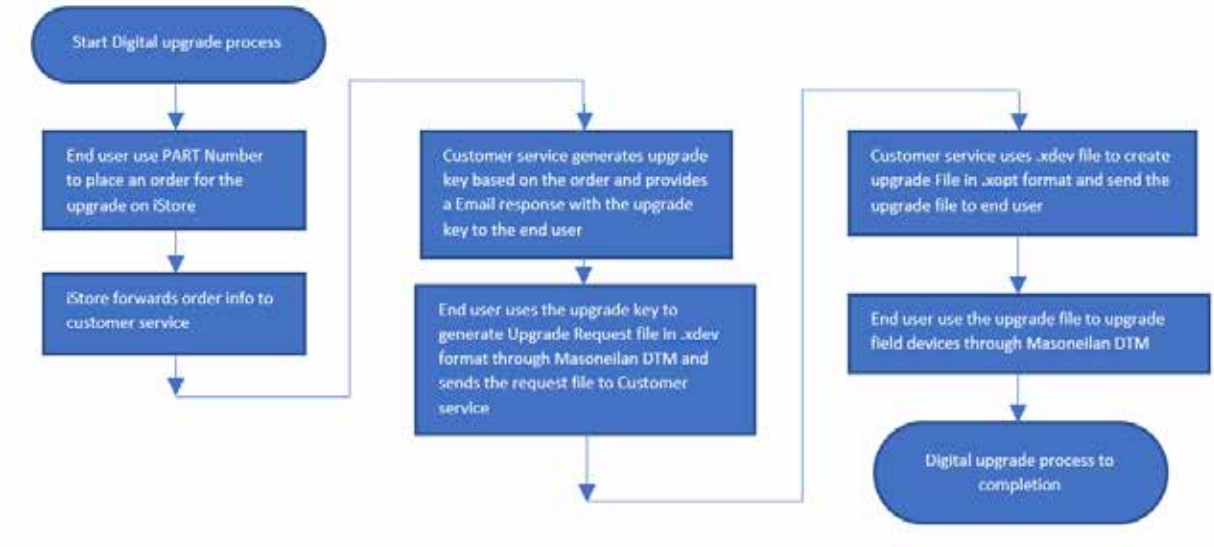


Figure 116 Order Process Flowchart

13.4.1 Request Upgrade

1. Select any positioner of the Masoneilan type that supports this feature, including an off-line positioner from the topology view, right-click and select **Additional Functions** > **Request Options Upgrade.**

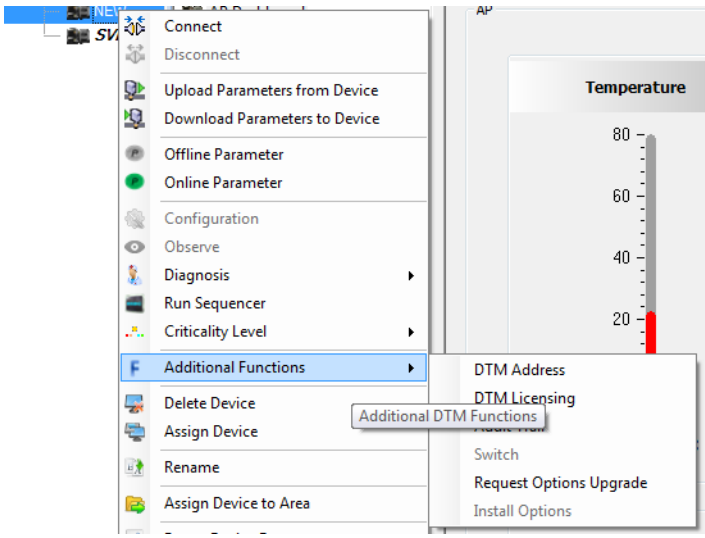


Figure 117 Additional Functions Items

Figure 118 shows an empty form. Otherwise, the data last saved appears. For ease-of-use, connecting to a device displays the *Serial Number* of the connected device. The check box is checked if the device is active.

See *Buttons and Fields* below for explanations of screen features.

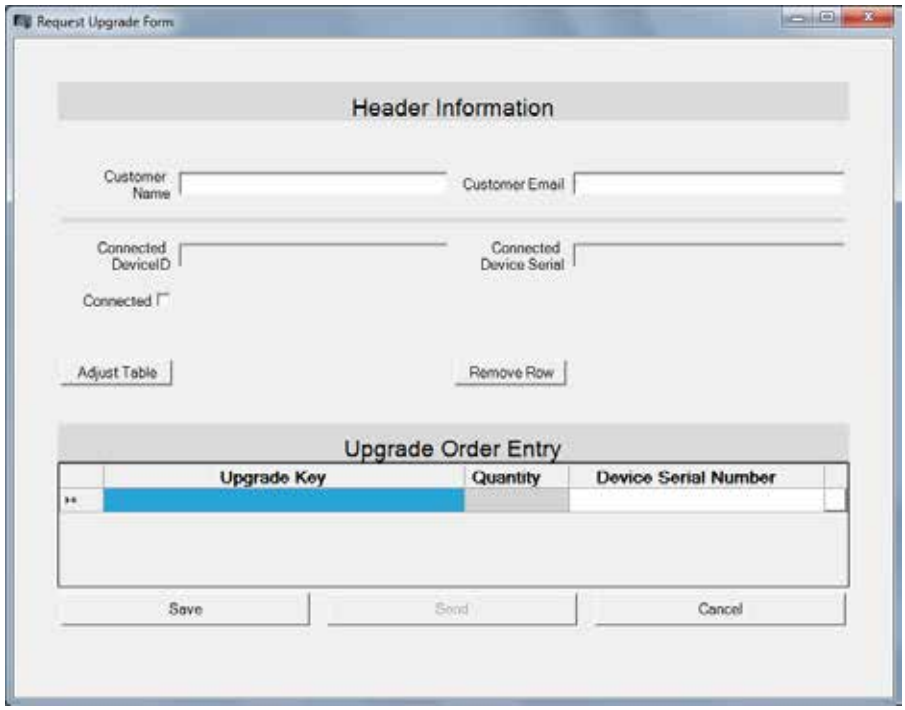


Figure 118 Request Options Upgrade

2. Fill in the *Header Information* and enter the order information. Click the ... button to enter an additional *Device Serial Number* pertaining to an *Upgrade Key*. For an explanation of the fields see *Buttons and Fields* below. All editable fields are required. A red exclamation point (*!*) indicates that the information is required.

   Note: Issue for original installation of version SVI2_SVI3 AP DTM 3.00.0:
   The Upgrade Key field is labeled as Part Number.

   The version of the screen (Figure 118) for 3.0.0 differs in other fields, some of which are required for processing but are included in the Upgrade Key for version 3.0.1 or later.

3. Click Save when you are ready to preserve what you entered before clicking *Send* or *Cancel*.

4. Click Send when you are ready to send us your completed order form and one of two dialogs appear. Click **Cancel** if you are not ready to send, but need to exit the dialog for whatever reason. See Send button or Cancel button for details.

Buttons and Fields

Customer Name	Enter the name for the installation site company.
Customer Email	Enter the email for the installation site contact. The options file that enables the digital upgrade is emailed to this address.
Connected Device ID	Displays the *Device ID* associated with the detected device. Once a device is disconnected, this field maintains that data until the screen is closed or the upgrade is sent or completed.
Connected Device Serial	Displays the serial number associated with the detected device. Once a device is disconnected, this field maintains that data until the screen is closed or the upgrade is sent or completed. The connected device's serial number can be copied and pasted into the order entry to add it to the order.
Connected	Displays a check if the device is connected. The device need not be connected to order an upgrade, but must be connected to complete an upgrade.
 *Adjust Table* button	Click this button to access a right-click menu to adjust how data is formatted in the Upgrade Order Entry grid: • *Auto Resize Columns include Headers:* Resizes the contents to fit the cell including headers. Once selected, you cannot resize or reorder rows until you select **Auto Resize Columns to Fill**. • *Auto Resize Columns exclude Headers:* Resizes the contents to fit the cell excluding headers. Once selected, you cannot resize or reorder rows until you select **Auto Resize Columns to Fill**. • *Auto Resize Columns to Fill:* Resizes its columns automatically to fill the width of the available display area. This is the default. With this selected, you can resize or reorder rows.
 *Remove Row* button	Click this button to delete a selected row, excluding the last empty row.
 Add Device for Upgrade button	Indicates a new line where you can add another device serial number (s) for another upgrade key. Another * line appears when the cell entry is completed (the user leaves the cell).
 Add License Serial Number button	Click this button to add another *Device Serial Number* column. The cursor appears in the cell preciously occupied by the clicked button. You can begin typing immediately.

Save button

Click this at least once to save your work to an *.xdev* file. This file is saved in the *Active Request* folder.

- It is sent during the present session, then it is moved to the *Archive folder* in the same directory.
- The *Request Digital Upgrade* dialog is closed without sending. In this case it is kept in the *Active Request folder*. You can select the *Request Options Upgrade* menu item and that same request opens with all saved data.

If you click **Cancel** before saving data entered since last save is lost. But you are prompted to not cancel before the data is lost.

Rend button

Click this at least once to send the file (as an .xdef file) to Masoneilan for processing (You must save before this button activates.). This opens a dialog (if Outlook is detected on the machine,) where you can click:

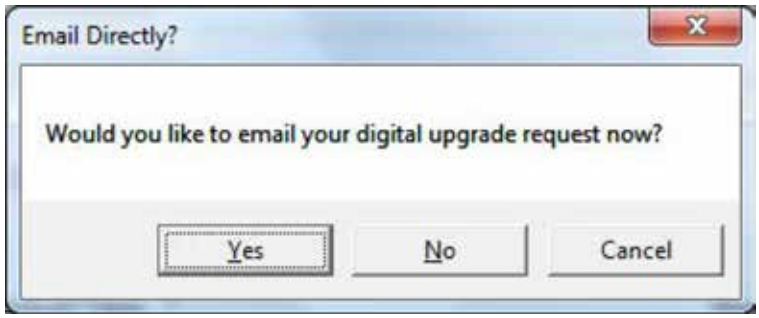


Figure 119 Email Directly?

If Outlook is not detected on the machine, the *Email Error* dialog appears. See the description from *Email Error* down.

- Yes: If you performed a save, the program automatically attaches the file to an email, which you can send for processing. Sends the email using Microsoft Outlook (). If this program is not installed or a version is installed that cannot be accessed automatically, then the following dialog appears:

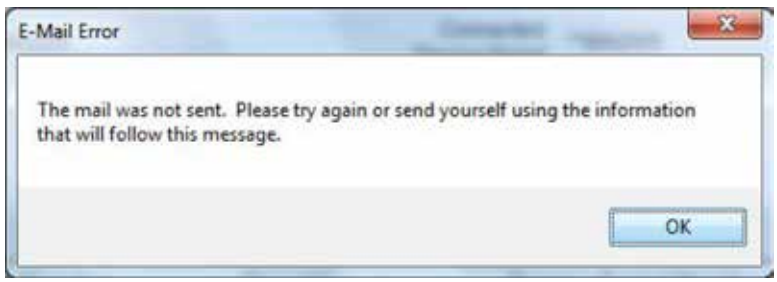


Figure 120 Email Error

Click **OK** and a dialog appears containing information for emailing later:

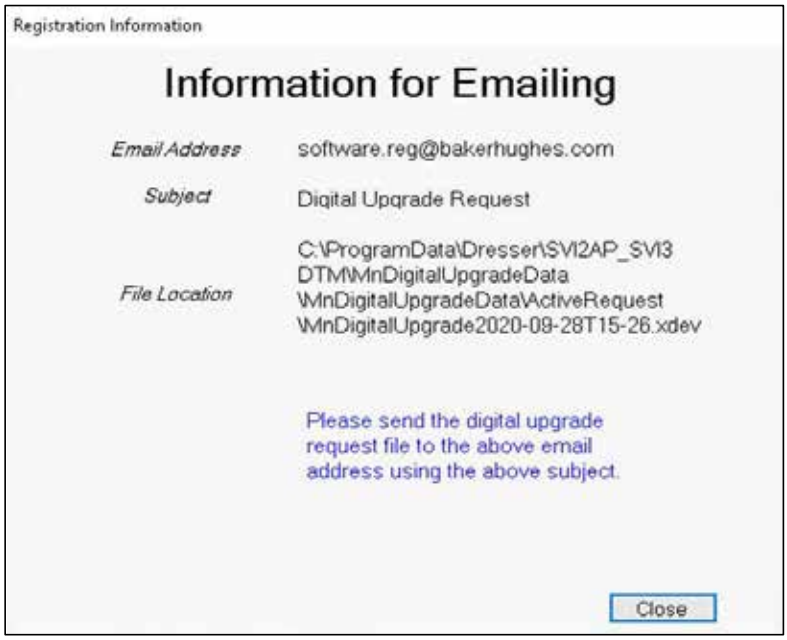


Figure 121 Information for Emailing

Either copy the file path and email address into another program or take a screen shot for use in emailing.

- No: Email at a later time by:
  1. Copying the file location field and using it to navigate to the directory where the upgrade request file is located or copying the file either to a media device or to somewhere on a network where an email server is available.
  2. Manually opening the email program, addressing the email as in the dialog, attaching the digital upgrade file and send. You cannot perform another upgrade request until this request (.xdef file) is sent as the newer upgrade deletes the existing file.
- Cancel: Cancels the process if not saved. If saved, see the discussion for selecting Yes above. The program remains open and you can proceed to add additional Upgrade Keys. You can then email later; see the description of the Send button. If you click Cancel before saving data entered since last save is lost. But you are prompted to not cancel before the data is lost.

Cancel button

Click this to cancel the process if not saved. If saved, see the discussion for selecting *Yes* above. *Cancel* closes the dialog without sending or saving the form. If the form was modified since it was last saved, the user is prompted to save.

13.5 Additional Functions: Install Options

Use this feature to install a digital upgrade once the .xopt file is returned to you. See Section 13.5.1 “Perform Upgrade”.

Figure 116 is a flowchart of the entire process for requesting and installing an upgrade.

Note: The fields on this screen allow you to copy them, including copying header information as well as individual fields. As you can copy data, the fields appear to allow editing, however, no edits are allowed.

13.5.1 Perform Upgrade

1. Ensure the positioner is connected, in *Setup* mode and that the system is offline.

   Note: A red exclamation point (!) indicates that the information is required.

2. Select the target positioner from the DTM *Topology View*, right-click and select **Additional Functions** > **Install Options Upgrade** and a form appears. (If you are not connected to a positioner/valve, this item is grayed out) The form will be empty if an .xopt file containing the target device serial number has not been previously loaded; otherwise, the form will contain options related information about the target device.

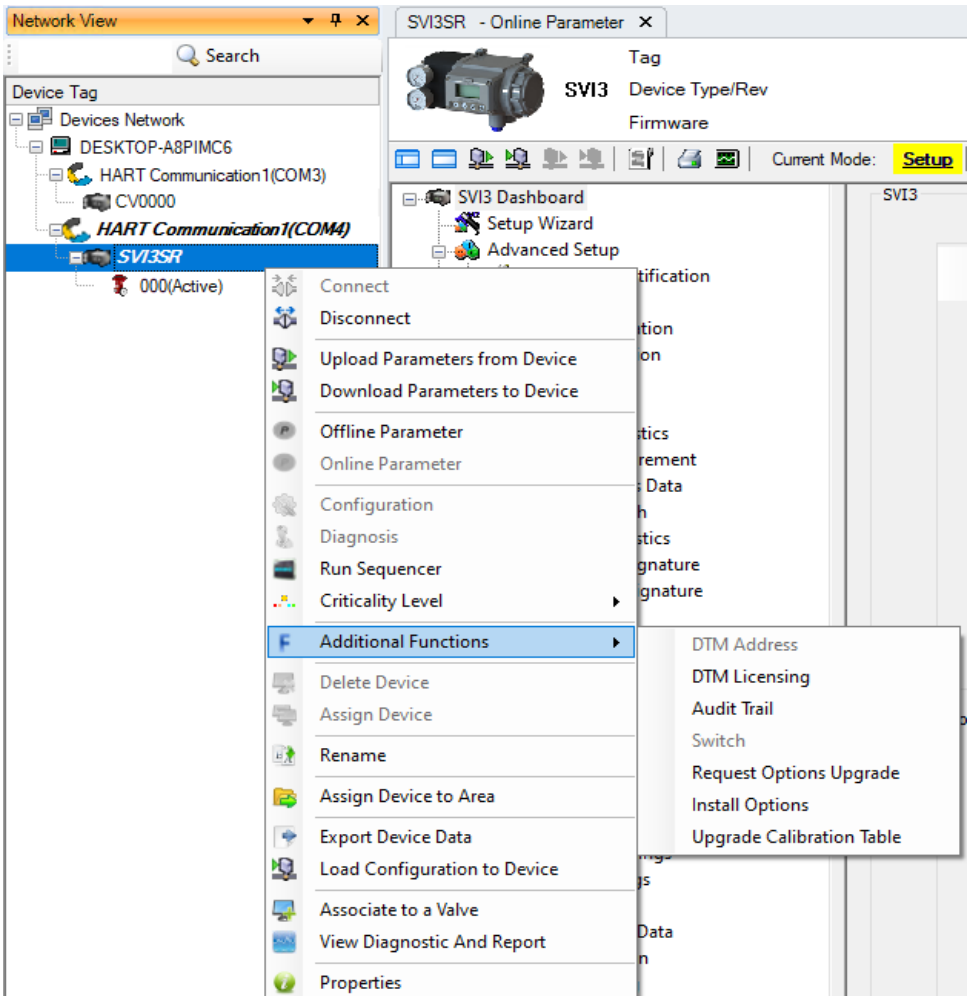


Figure 122 Upgrade Menu Selection

The screen appears.

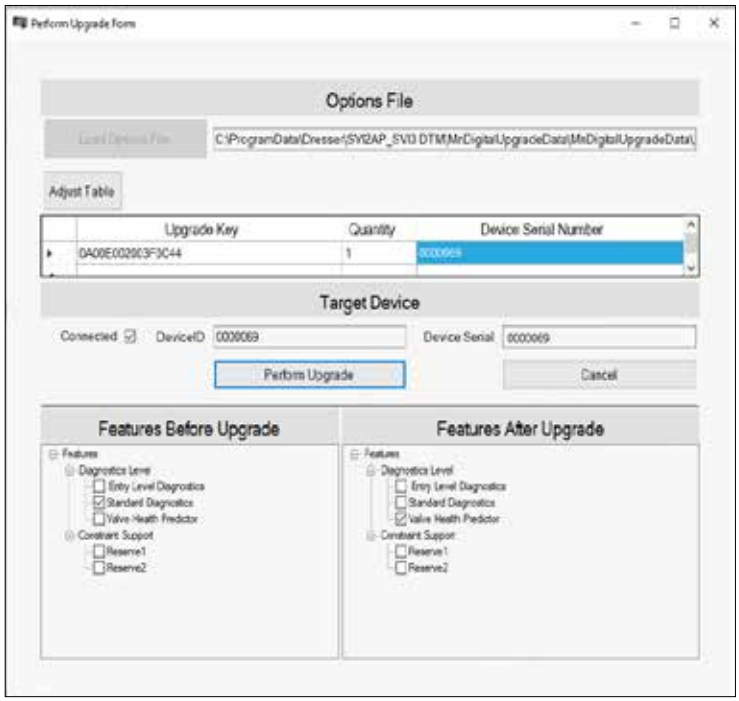


Figure 123 Perform Screen

3. Import the .xopt file:
   - Option 1: Drag-and-drop the file directly from the email message from Baker Hughes containing the upgrade file, or from a file explorer after you have saved the .xopt file attachment to the local drive.

     Then click Load Options File.
   - Option 2: Save the .xopt file attachment to the local drive. Then click Load Options File and an Open dialog appears.

     Browse to the folder where you saved the file, select it and click Open.

If the *Serial Number* for the connected device is not a match to any of the device serial numbers in the file, the dialog below appears.

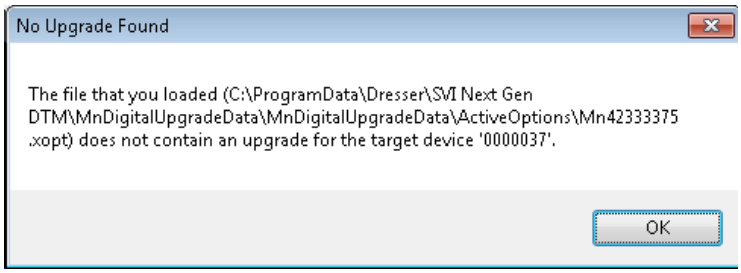


Figure 124 Unmatched Serial Number

See *13.5.2 "Background Information"* for more information on *Serial Numbers* and .xopt functionality during this process.

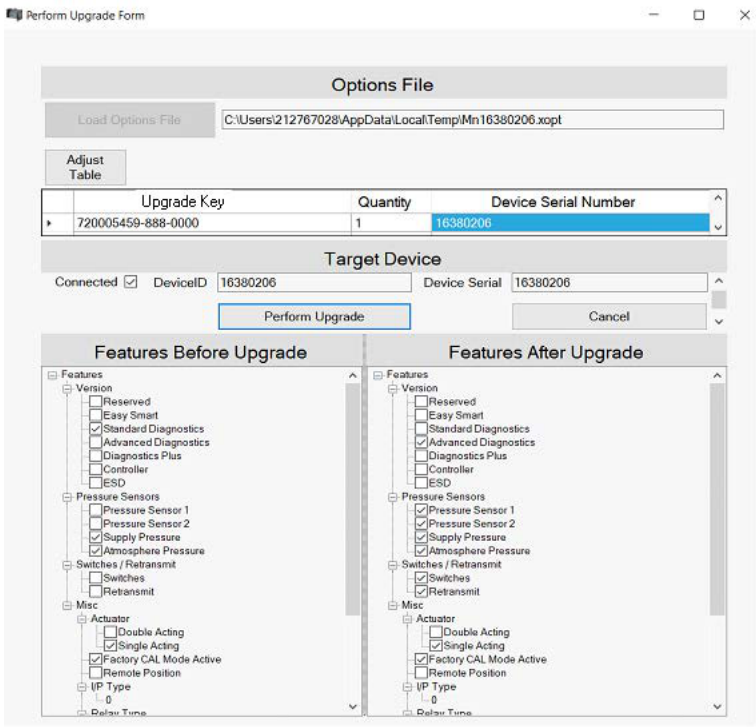


Figure 125 File Loaded

Note:The fields on this screen allow you to copy them, including copying header information as well as individual fields. As you can copy data, the fields appear to allow editing, however, no edits are allowed.

4. Click Perform Upgrade to write the new options to the device. The dialog closes. Then a message dialog appears that reports the outcome of the action. If desired, see *13.5.3 "Verification Procedure"* for a procedure to verify the installs success.

13.5.2 Background Information

Once you have imported the file, you will not have to do it for each positioner listed in the file as it will automatically load the .xopt file containing the device serial number of the connected device when you subsequently select to perform upgrade from the DTM menu.

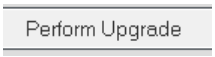
The file path appears in a window. The screen is filled from the information provided in the loaded .xopt file. (If the .xopt file contains many devices to upgrade, the display may not show all the devices clearly. You can manipulate the size of the table elements by dragging as per normal Windows functionality or use the *Adjust Table* button as per the description on the last page. The display settings are remembered the next time the digital upgrade is selected.

The device serial number matching the target device serial is highlighted. Also, device serial numbers in the table that have already been upgraded are highlighted with a lighter color. You must connect to a device whose device serial number appears in the file. If you are not sure to which device the .xopt file pertains, connect to any Masoneilan device that supports this process and you can use the information in the table to connect to the appropriate device. The current options set for the connected device appear in the *Features Before Upgrade* tree and the options that will be set after the upgrade is performed are shown in the *Features After Upgrade* tree. You might want to verify that it is what you want before actually performing the upgrade.

13.5.3 Verification Procedure

1. Connect to the device.
2. Select the perform upgrade.
3. Load the options file again pertaining to the upgrade. (It is loaded automatically if there are more devices to upgrade in the options file). The S/N of the connected device appears highlighted in blue in the data view cell, indicating that it was upgraded.
4. Ensure that the *Features Before Upgrade* and the *Features After Upgrade* trees are identical to indicate the upgrade options set.

Buttons and Fields

 *Load Options File* button	Click this button and an *Open* dialog appears to select the file containing the upgrade data.
 *Adjust Table* button	Click this button to access a right-click menu to adjust how data is formatted in the *Upgrade Order Entry* grid: • *Auto Resize Columns include Headers*: Resizes the contents to fit the cell including headers. Once selected, you cannot resize or reorder rows until you select **Auto Resize Columns to Fill**. • *Auto Resize Columns exclude Headers*: Resizes the contents to fit the cell excluding headers. Once selected, you cannot resize or reorder rows until you select **Auto Resize Columns to Fill**. • *Auto Resize Columns to Fill*: Resizes its columns automatically to f ill the width of the available display area. This is the default. With this selected, you can resize or reorder rows.
Device ID	Displays the ID of the connected device.
Device Serial	Displays the serial number associated with the connected device.
Connected	Displays a check if the device is connected.
Upgrade grid	Lists the *Upgrade Key, Quantity and Device Serial Number* related to each line in the sales order for which an upgrade is being per-formed. The device serial number matching the target device serial is highlighted. Also, device serial numbers in the table that have already been upgraded are highlighted with a lighter color.
 *Adjust Table* button	Click this button to access a right-click menu to adjust how data is formatted in the *Upgrade Order Entry* grid: • *Auto Resize Columns include Headers*: Resizes the contents to fit the cell including headers. Once selected, you cannot resize or reorder rows until you select **Auto Resize Columns to Fill**. • *Auto Resize Columns exclude Headers*: Resizes the contents to fit the cell excluding headers. Once selected, you cannot resize or reorder rows until you select **Auto Resize Columns to Fill**. • *Auto Resize Columns to Fill*: Resizes its columns automatically to fill the width of the available display area. This is the default. With this selected, you can resize or reorder rows.
 *Perform Upgrade* button	Click this to commence the upgrade process.
Features Before Upgrade	Lists the features present before upgrade. After the upgrade is successfully completed this matches *Features After Upgrade.*
Features After Upgrade	Lists the features present after upgrade.

13.6 Additional Functions: Update Calibration Table

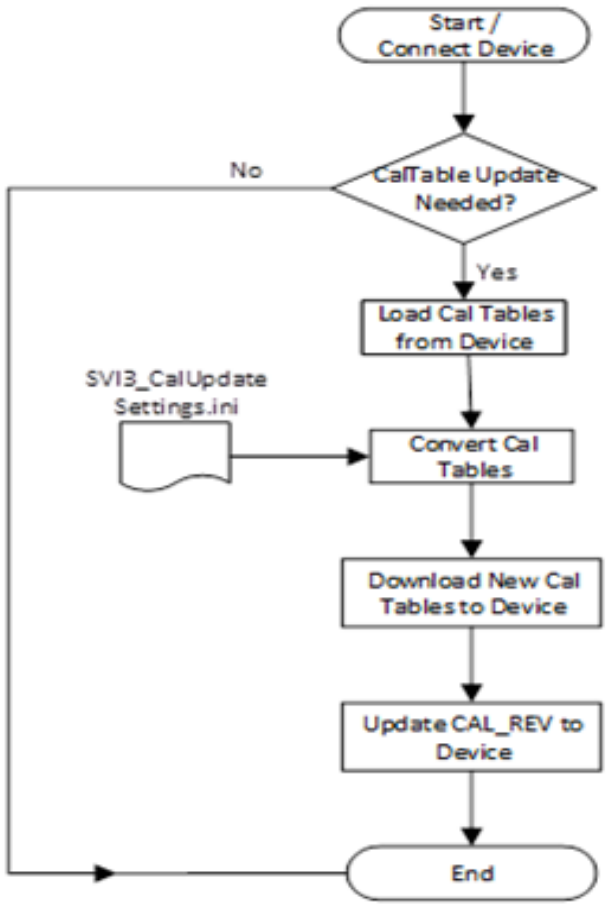
13.6.1 Background

When SVI3 positioner is upgraded to Firmware from Version 1.1.2 to version 1.2.1 or above, the calibration tables of main module and peripheral boards need to be upgraded to support SmartRecovery feature with best performance.

SVI3 DTM offers auto and manual ways to help user to upgrade the calibration table of the positioner under different scenarios.

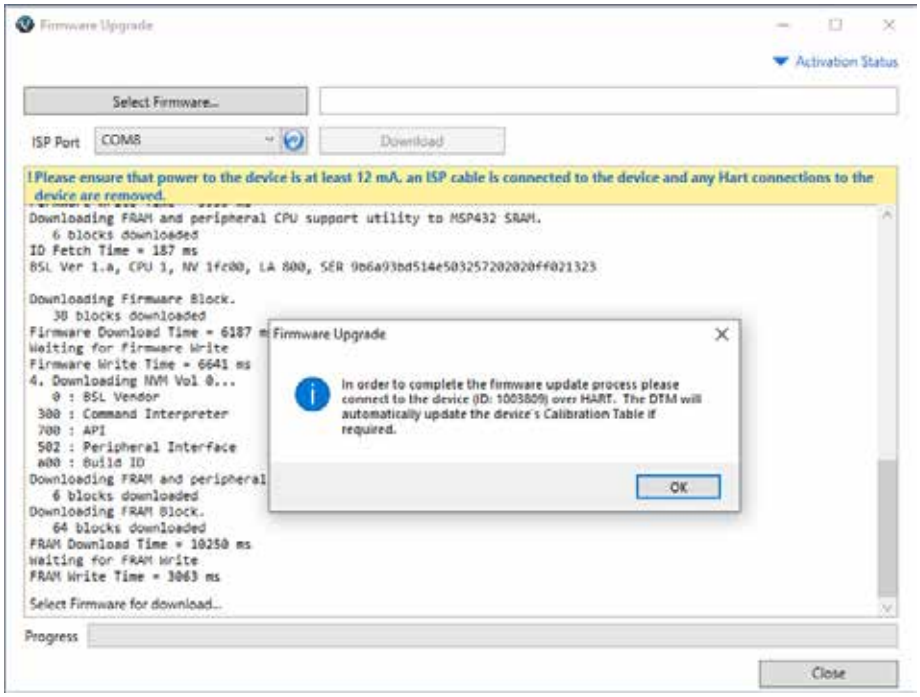
13.6.2 Process to update SVI3 Calibration Table

The following flow chart shows how DTM updates a calibration table:



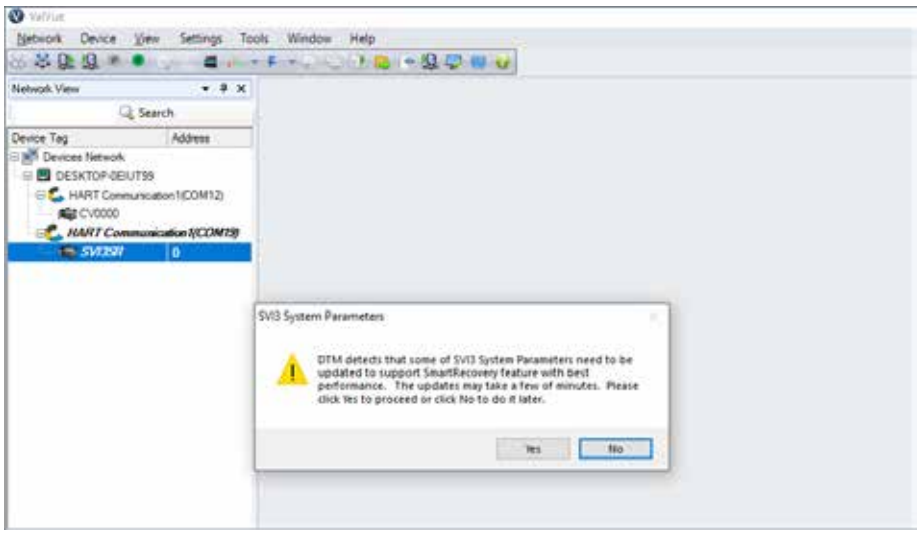
13.6.3 Auto update Calibration Table

When ValVue3 completes to upgrade SVI3 firmware from version 1.1.2 to to version 1.2.1 or above, it will pop up a message dialog to prompt user to connect DTM to update calibration tab



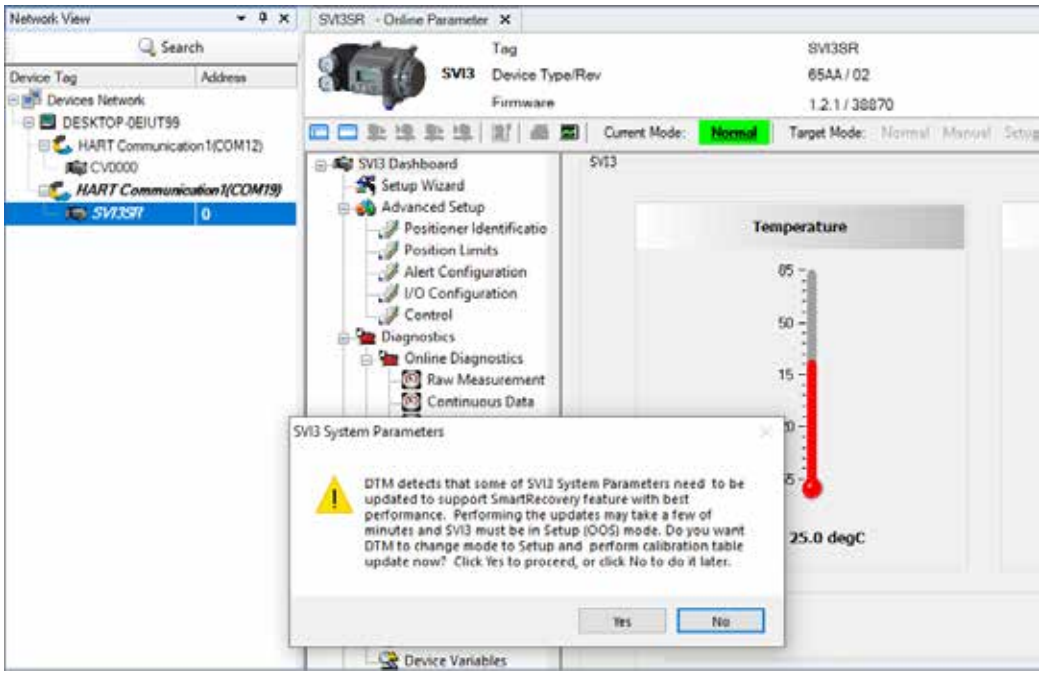
Once the SVI3 DTM is connected to SVI3 Revision 2 or above, the DTM will check if the device calibration tables need to be updated.

- If the calibration tables have already been updated, the DTM connects to DTM without doing anything.
- If the calibration tables have not been updated, the DTM will automatically pop up the following message to ask the user's confirmation to perform the update.



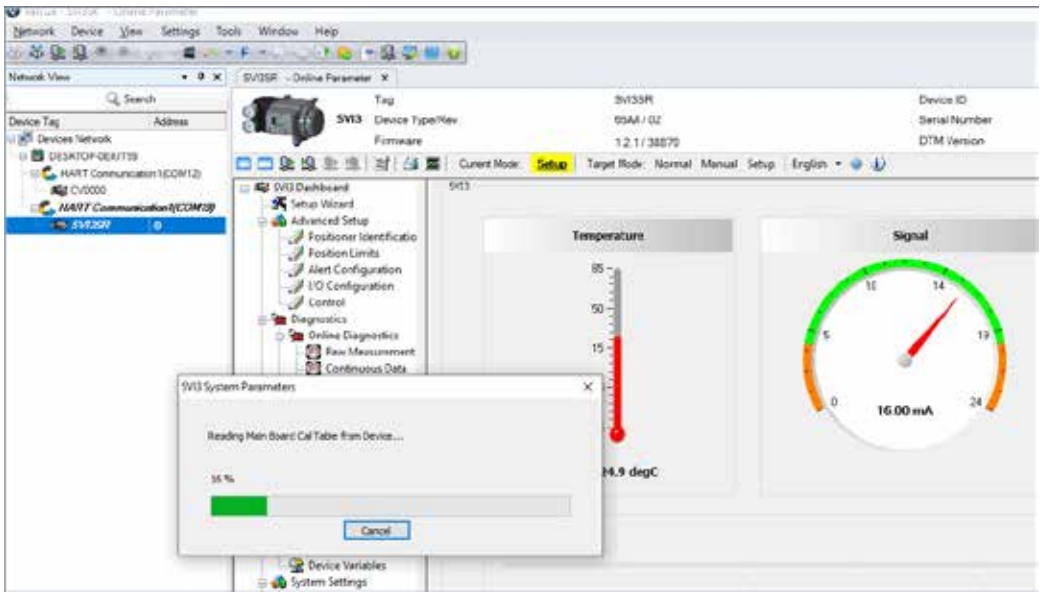
Click Yes button to proceed the update. Updating calibration tables require SVI3 to be in Setup Mode. If device is not in Setup Mode, following message dialog will be popped up and user's confirmation is needed.

Warning: Position will not follow input signal when device mode is changed from normal operation (Normal) mode to Setup, and control application will be interrupted.

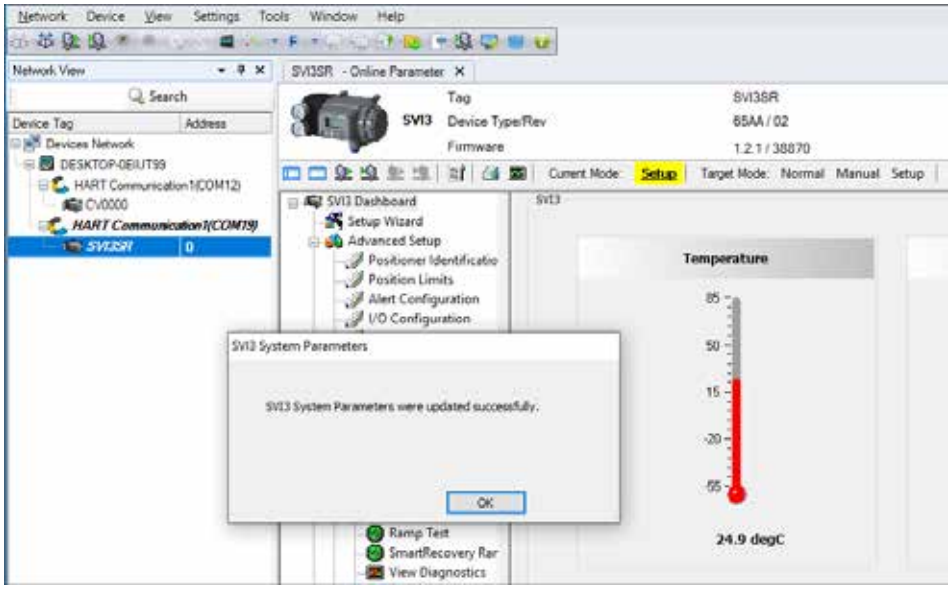


Clicking Yes to change device mode and proceed the device update

When updating process starts, DTM displays progress bar to indicate the calibration table update status.

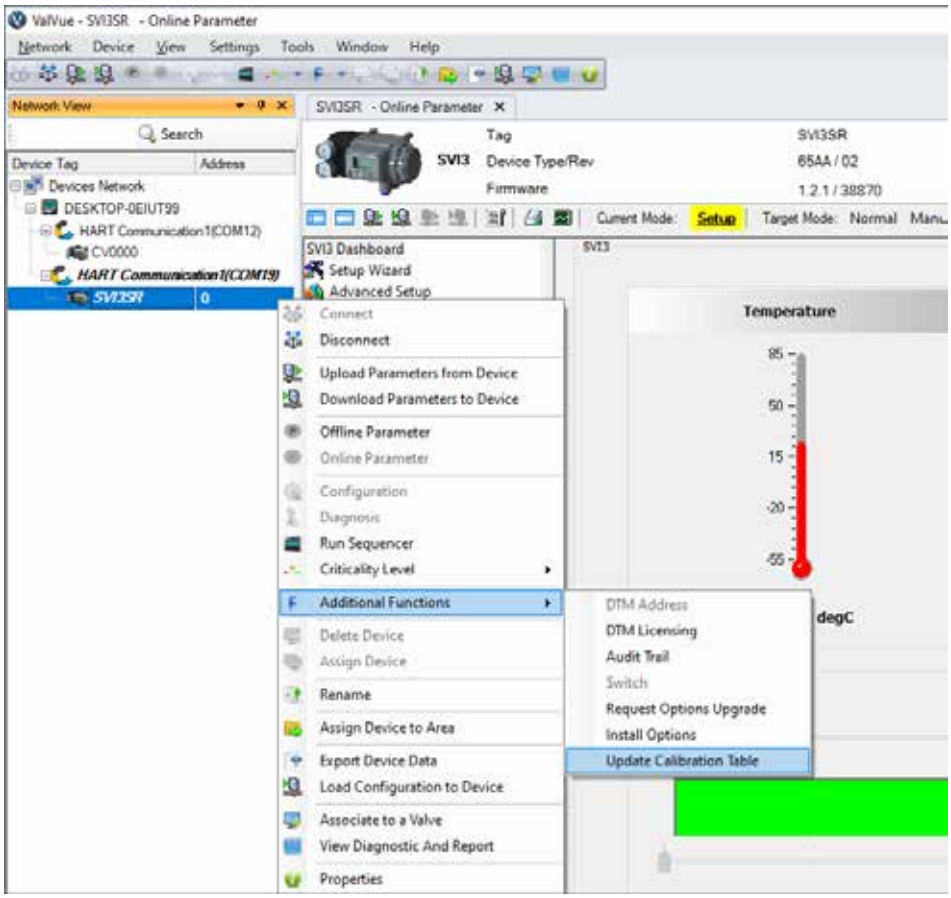


A completion message dialog pops up after the update process completes (if applicable), and DTM will reset device mode to its original.



13.6.4 Update Calibration Table OnDemand

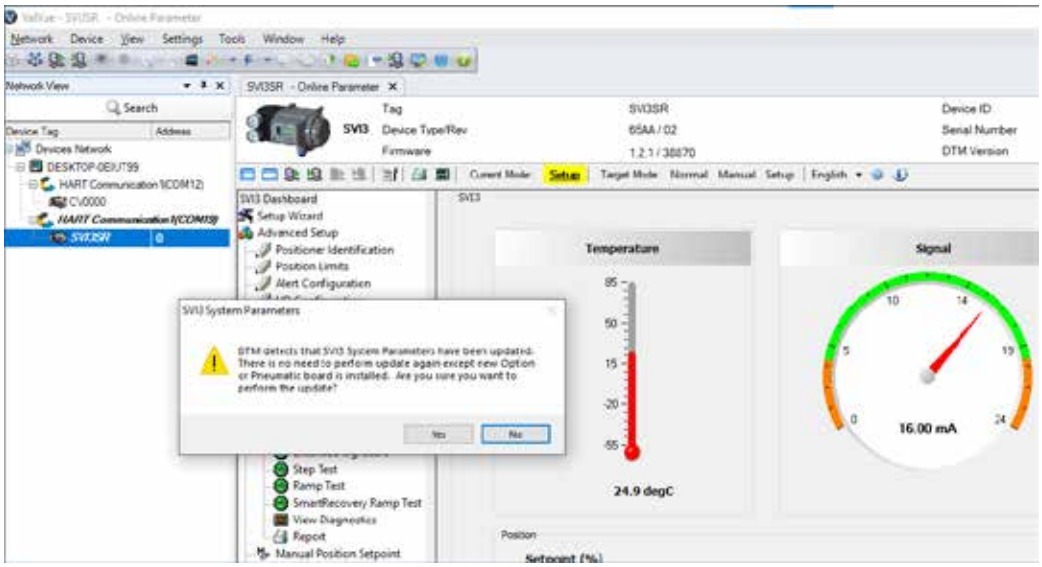
In case that device calibration tables have been updated, but later on user replaces with or adds new peripheral board, the calibration table of new added board needs to be updated. SVI3 DTM also provides a OnDemand method to update device calibration table manually. Use menu entry Additional Function -> Update Calibration Table to start manual update process.



With following use cases, user could update device calibration table OnDemand

- The calibration table of a peripheral board may be a replacement or new added board
- The calibration tables of the device have been updated, but the user wants to update device again
- User skips auto update process, and he wants to update device manually

Follows on screen instructions to complete the update process.



14. Report

14.1 Report

Use this screen to view a report of general configuration parameters, operating data and diagnostic data. Once created the report can be exported to pdf. To open the report:

• Click the  *Print* icon in the SVI3 DTM toolbar.

The SVI3 report includes following contents:

- General Information
- Positioner Hardware Information
- Configuration Information
- Control Parameters
- Operation Data
- Raw Data
- SmartRecovery Configuration
- Valve KPI Limit and Alert Configuration
- Valve KPIs
- Most recent Offline Diagnostic test results

Masoneilan
a Baker Hughes business

SVI3 Report
Smart Valve Interface Results

General Information					
Device Tag	SVI3REV2	**Device S/N**	0000057	**Device ID**	0000057
Long Tag	SVI3 SMARTRECOVERY		**Model Code**	SVI3-31121200	
Dev. Type/Rev	65AA / 02	**Polling Address**	0	**Date**	6/19/2021
Diagnostics Level	Online Valve Diagnostics		**DTM Rev**	3.20.0 BuildID: 091721	
Descriptor	SVI3 REV2		**Firmware Rev**	1.2.1	
Message	THIS IS A SVI3 REV2 POSITIONER				

Positioner Hardware Information			
Module Name	**Serial Number**	**Firmware Revision**	**Hardware Revision**
Pneumatics Module	PL0b2018030043	1	1
Option Module	000019	1	2
User Interface Module	badc123	1	2

Configuration Information					
Input Signal Range	**Lower**	4.00 mA	**PosRetransmit**	**Lower**	0.00 %
	Higher	20.00 mA		**Higher**	100.00 %
Position Error	Off	**Error Band**	5.00 %	**Deviation Time**	Off
User Interface	**Language**	English		**Pressure Unit**	kPa
	Button Lock Level	Allow Local Buttons		**Digital Input**	Enable
Position Sensor	Internal Position Sensor				

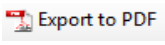
DO SW #1	**Function**	Failsafe	**Normally**	Closed	**Value**	N/A
DO SW #2	**Function**	Failsafe	**Normally**	Closed	**Value**	N/A

Position Limits	**Allow Diagnostic/Tune to Override Limits**	On	**Near Closed Value**	1.00 %
	Lower Limit	Off	**Upper Limit**	Off

Figure 126 Report

Buttons and Fields

The icon bar at the top contains the following functionality:

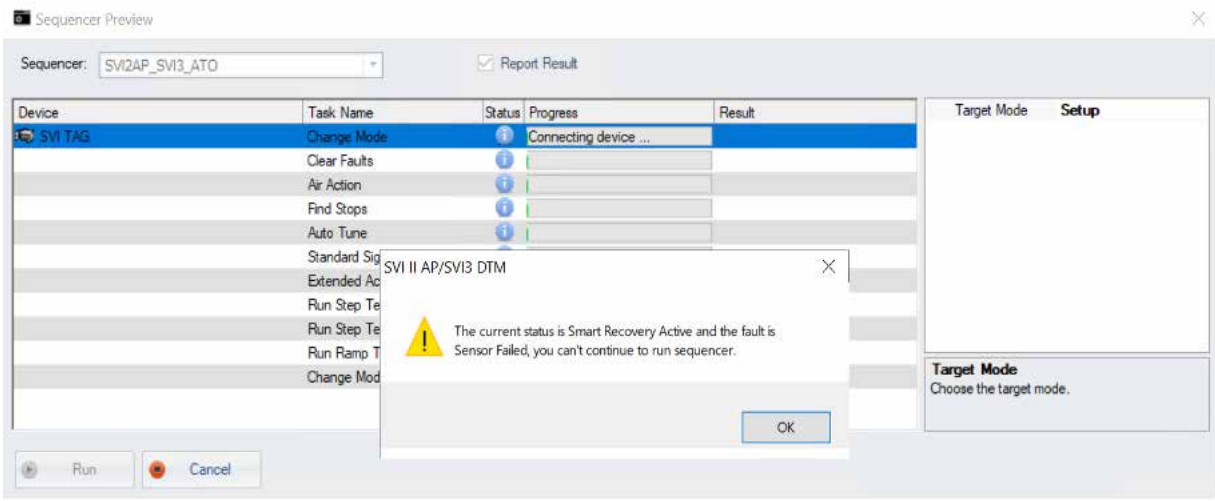
 *Toggle Sidebar*	Opens the sidebar where you view thumbnails of each page.
 *Print*	Prints the report to the default printer.
 *Copy*	Disabled.
 *Find*	Opens a *Find* dialog to search the report.
 *Zoom*	Use the left icon to zoom in, the right icon to zoom out or the presets in the pulldown list.
 *Fit Width / Fit Page*	Use the left icon to fit to the width of the screen or the right icon to fit page to the screen size.
 *Page View*	Use the left icon to view a single page, the center to view continuously and the right to see a grid to select a number of pages to view.
 *Backward/ Forward*	Disabled.
 *Refresh*	Refreshes the report content. The device must be connected to refresh content.
 *Selection Mode*	Right-click to a get a menu of copy functions that include: • *Pan Mode*: Click and drag to move the report physically around. • *Selection Mode*: Click and drag an area to copy as text. • *Snapshot Mode*: Click and drag an area to catch a graphic image.
 *Snapshot*	Use to take a snapshot of a selected area.
 *Export to PDF*	Exports the report to a selected directory.

15. Execute SVI3 Sequencer from ValVue3

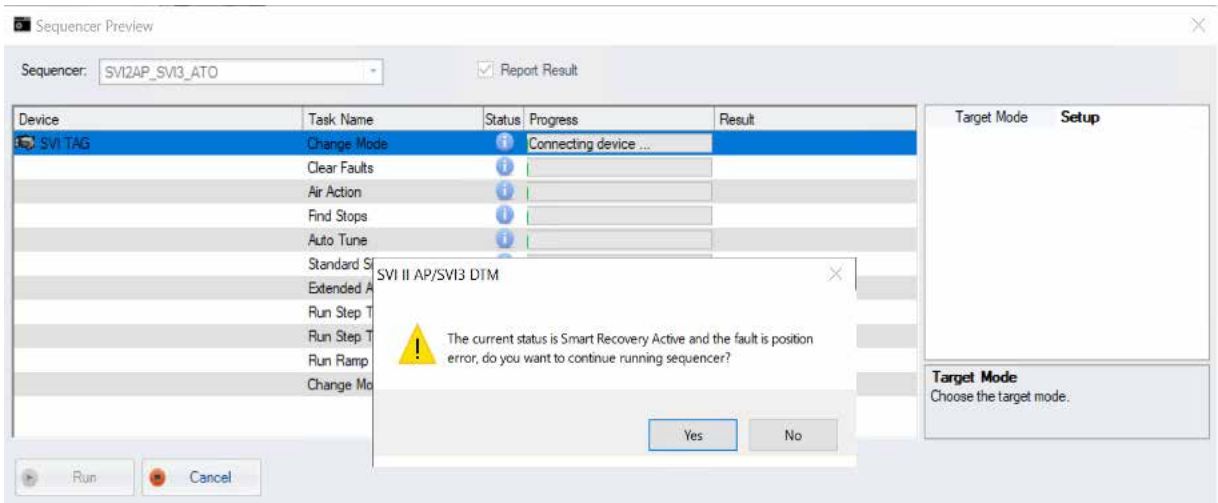
Executing SVI3 sequencer is supported only when the DTM runs within ValVue3 environment. For detail about how to manage and execute SVI3 sequencers, please refer to Sequencer Management and Execute Sequencer in *Masoneilan ValVue Software Instruction Manual*.

15.1 Executing Sequencer when device is at SmartRecovery control mode

1. If the device is in SmartRecovery Control mode that is triggered by “SmartRecovery Position Sensor Failed” fault, sequencer will not be allowed to run on the device.



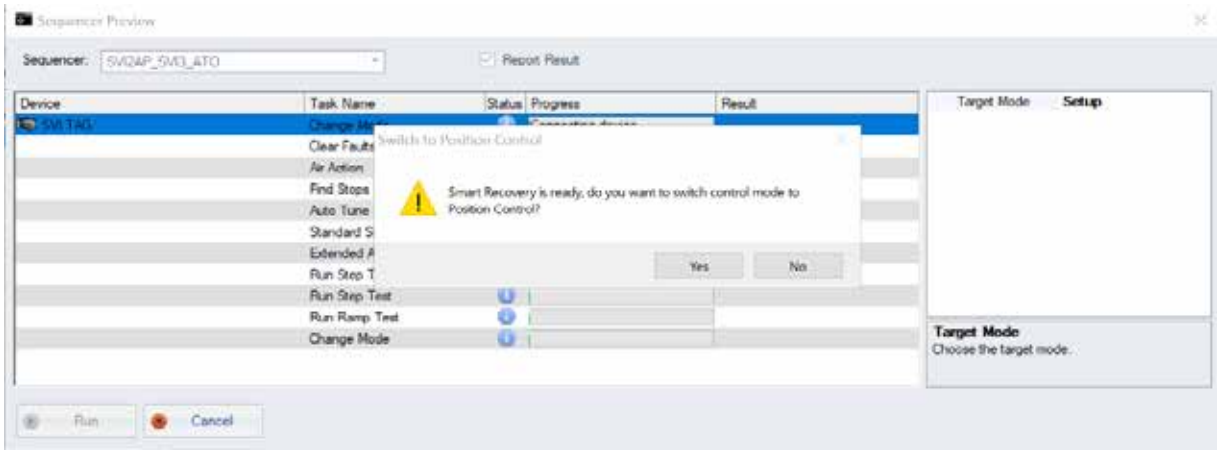
2. If the device is in SmartRecovery Control mode triggered by “SmartRecovery Position Error” fault, ValVue3 will let user choose to continue running the sequencer or not.



3. If the device is in SmartRecovery Control mode but it is ready for switching back to Position Control mode, ValVue3 will ask user's confirmation to switch the control mode before the sequencer is started.

   Choose No-> Sequencer will be executed in SmartRecovery Control mode

   Choose Yes-> Sequencer will be executed in Position Control mode



4. If the sequencer is running on multiple devices, ValVue3 will directly run the sequencer on the devices. The warning messages in case 1), 2) and 3) will be disabled.

16. Continuous Valve Diagnostics Concept

Since its introduction HART has been well accepted by customers for the opportunity it provides for device diagnostics. The device health and status are even more important for the final control elements used in a controlled process – positioners, and analog and discrete output devices.

This document describes the diagnostic features integrated in the SVI3 positioner and provides some guidelines how they can be used in applications.

16.1 Introduction

Evaluation of the valve/positioner state requires:

1. Appropriate conditions to collect informative data

2 Data collection

3 Data processing

Different measures to estimate the valve health may require different conditions, rate of data collection and often put special requirements on the amount of data collected and speed of data processing. In order to provide the best information, the SVI3 provides three different diagnostic approaches:

- 16.1.1 “Off Line Diagnostics”: Off Line diagnostics are used when the application process is not running. Off-line diagnostics procedure execution requires significant changes of valve setpoint, which disturbs the application process.
- 16.1.2 “On Line Diagnostics”: On Line diagnostic procedures collect data while the valve is running and do not disturb the application process. SVI3 DTM are used to collect the data from the valve, evaluate performance and present the information.
- Continuous diagnostics: To view data about valve operations at closing and opening, which useful in valve operation analysis.

16.1.1 Off Line Diagnostics

Off Line diagnostics are used when the application process is not running. Off-line diagnostics procedure execution requires significant changes of valve setpoint, which disturbs the application process.

When Off Line diagnostic procedures are executed, the data is collected in the SVI3 positioner at a very high rate (e.g. between 10 and 60 times per second) and then it is uploaded and presented by the SVI3 DTM.

Step Test

Step test evaluates how the positioner is responding on a request to change in the set point significantly for a short time. It gives a good measure of the actuator/valve speed.

Ramp Test

Ramp test measures the relationship between the set point and actual actuator/valve position, when the setpoint is changed at a limited rate. It gives a measure of valve position error and hysteresis & deadband.

Signature

Valve Signature provides a relationship between the actuator pressure and the actuator/ valve actual position. It is good indication of seating profile, valve friction.

16.1.2 On Line Diagnostics

On Line diagnostic procedures collect data while the valve is running and do not disturb the application process. Special tools are used to collect the data from the valve, evaluate performance and present the information.

DTM

The SVI3 DTM can provide a basic level of online diagnostic by presenting the data from the positioner in numeric or graphical form. You can also export the data for further analysis with external tools.

16.2 Continuous Diagnostics

Continuous diagnostics are executed in the device and continuously evaluate the status of the positioner, the actuator and the valve.

The diagnostics described in this section are implemented in the firmware or in the positioner hardware. The problem detection algorithms are running continuously and provide immediate notification for detected events. The SVI3 positioner can detect two basic groups of events:

- Problems in the positioners performance
- Problems in the actuator/valve control

16.2.1 Positioner Diagnostics

Positioner diagnostics are used to evaluate the state of the positioner itself. The positioner is designed so that it continues to communicate, if the detected problem so allows. A limited number of severe failures detected in the hardware and the positioner may not be able to report when a failure is detected. In this case, the positioner continues to control the valve if possible. If control of the valve is not possible, the positioner de-energizes its output, driving the valve to de-energized position, as defined by the actuator.

Processor Failure

Failures in the processor program execution are reported in this group of alerts.

Examples of this kind of failure include:

- Program execution failure detected by a watch dog
- Program memory failure
- NV memory failure, etc.

Sensor Failure

This failure is reported when the diagnostic procedures detects problem in the supporting sensors, embedded in the positioner. These are:

- Supply pressure sensor
- Temperature sensor, etc.

Valve Control

Problems detected with valve control are reported in this group. If the actual position cannot be driven to follow the setpoint, a valve control failure is reported. There may be multiple reasons for this failure:

- Problem with the supply pressure
- Obstacle in the valve movement, etc.

Commissioning

This problem is reported if the positioner has not been calibrated. The Find Stops procedure must be executed to clear the problem. If the positioner is shipped installed on the valve, it is factory calibrated and this problem won't occur.

Air Supply

This problem is reported if the supply pressure is out of the spec (most likely too low).

Supporting Hardware

This problem is reported if a failure in one of the supporting accessories is detected:

- Local LCD display
- Remote Position Sensor, etc.

16.2.2 Valve/Actuator Diagnostics

The SVI3 positioner collects information from multiple sensors. This information is used to evaluate the quality of valve and actuator control and the working conditions.

Valves and applications may have significant differences in the expected behavior – e.g. small valves usually are fast and are able to reduce the error between the setpoint and actual position within seconds, valve wear may be significantly impacted by the content and temperature of the fluid being processed or by the material used to make the valve.

To adjust to the variety of applications, SVI3 positioners provide a set of parameters, which can be modified to adjust to the specifics of the process being controlled. Adjustable alert points and dead bands (where applicable) are provided for the monitored parameters and can be modified from default settings to reflect the specifics of the application.

An alert is set when the monitored value crosses the point defined by the Alert Point and stays active until the alert is cleared or the monitored value is restored to within the expected limits. Dead band can be used to avoid multiple notifications for the same event.

For each alert the SVI3 provides an Historic Alert – a flag indicating if the alert happened since the alert has been cleared.

Position

Position alerts is set if the actual valve position has been out of the expected alert limit for a period of time that can be configured by DTM. The alert is cleared when the position is within the limits again (including Position Error Band).

Friction

The actual value of the valve friction is monitored, and an alert is set if it is out of the limits.The following limits provide different alerts:

- HIHI Alert triggered by HIHI Alert Limit
- HI Alert triggered by HI Alert Limit
- LO Alert triggered by LO Alert Limit
- LO LO Alert triggered by LO LO Alert Limit

16.2.3 Discrete Switch Configuration

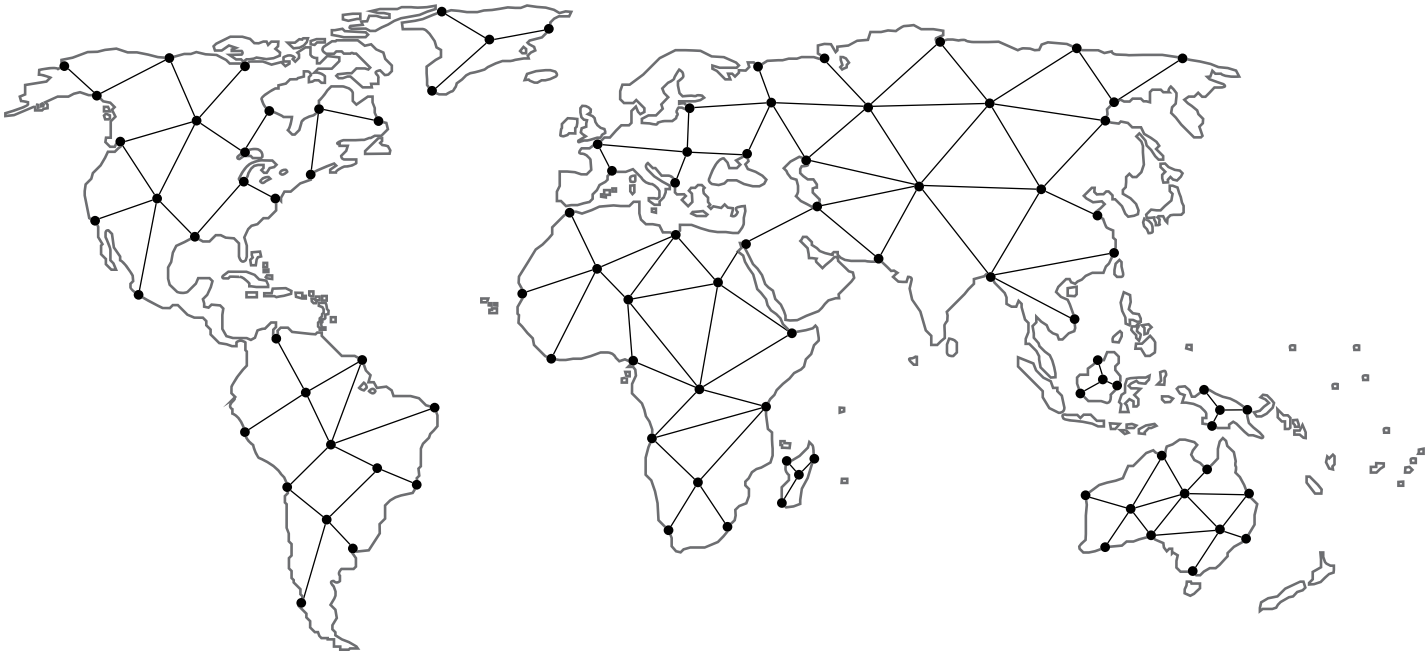
The SVI3 has a discrete switch (contact) DS1, which can be used to drive external equipment. Discrete Switch 1 can be activated if one of the following diagnostic conditions is detected:

- A failure in position control algorithm and the actuator is in Fault (de-energized) State
- The position control algorithm is not In Normal state
- Tight shutoff occurred
- Alarm low limit
- Alarm high limit
- Position control algorithm has been re-initialized
- Positioner is in Manual or Out of service mode

This switch can be used (with minimal external equipment – e.g. one solenoid and no additional logic) to keep the valve in place when the supply pressure drop or when the valve position is above the High Limit and Hi Position Alert is reported.

Find the nearest local Channel Partner in your area:

valves.bakerhughes.com/contact-us



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BHMN-SVI3-DTMSoftware-IOM-34569B-1023 10/2023

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